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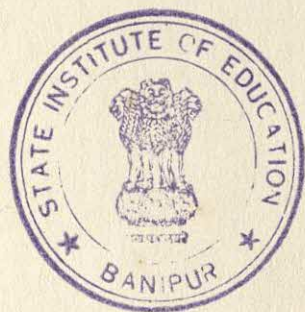
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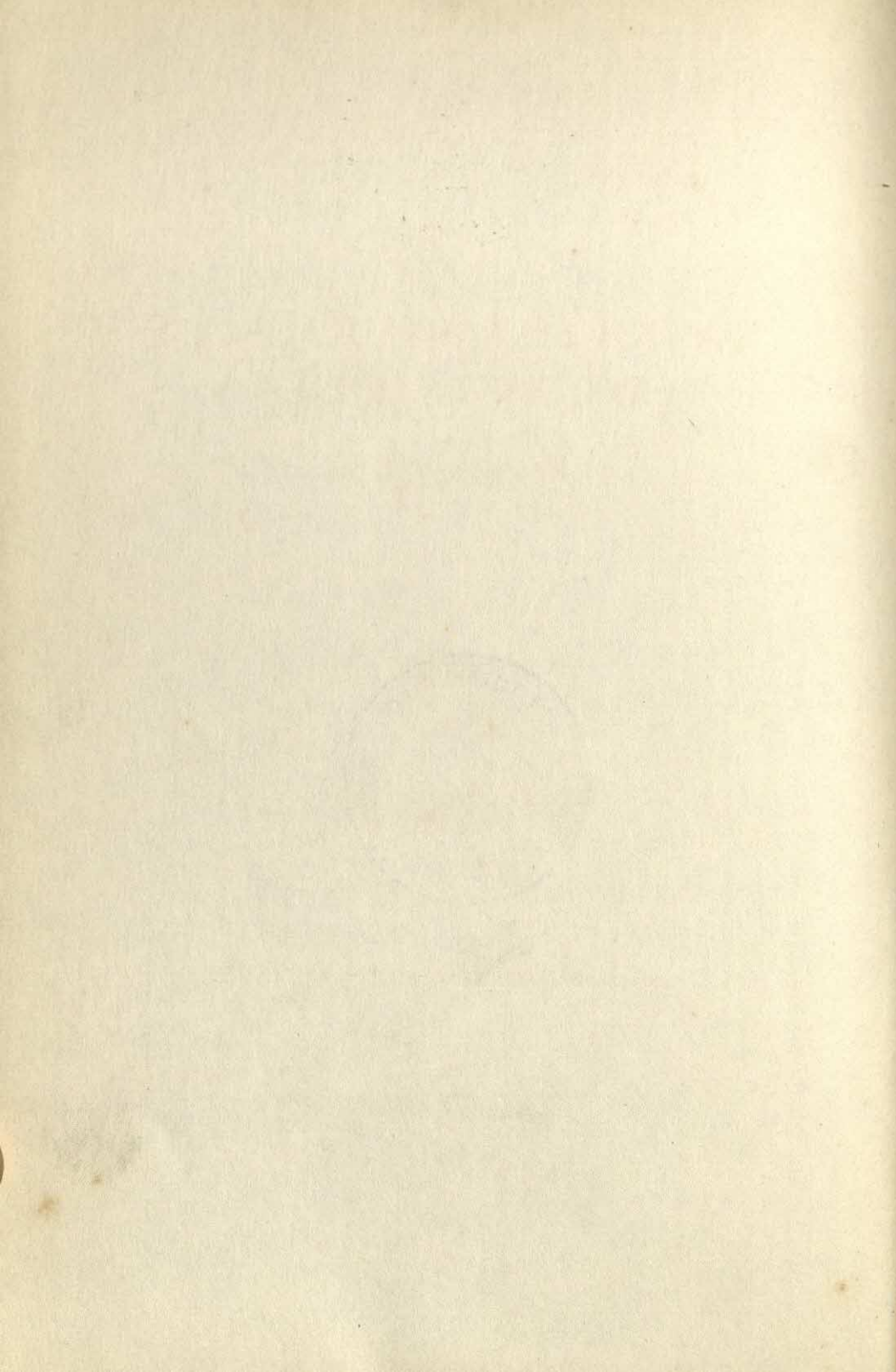
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The
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Volume 4

DAMASCUS—FORT STANWIX

AN ILLUSTRATED TREASURY OF KNOWLEDGE

Publishers Company, Inc.

Washington, D.C.

Key to Pronunciation

VOWELS

- ă* (short), as in *hat, cat*.
ā (long), as in *ale, hate*.
ā (Italian), as in *car, mar*.
â (short Italian), as in *fast, class*.
ɑ (broad), as in *all, fall*.
â (circumflex), as in *care, snare*.
ɑ or *q* (short obscure), as in *final, spinal*.
â (long obscure), as in *surface*.
ae, as in *Caesar*, = *ē*.
ē (short), as in *net, met*.
ē (long), as in *me, eve*.
ê (circumflex = *â*), as in *there*.
ē (tilde), as in *her*.
ε or *ε* (short obscure), as in *patent*.
ê (long obscure), as in *delay*.
ē = *ī*, as in *pretty*.

- ī* (short), as in *hit, bit*.
ī (long), as in *kite, mite*.
ī (tilde), as in *sir*.
i (short obscure), as in *habit*.
î (long obscure), as in *idea*.
ō (short), as in *pop, hop*.
ō (long), as in *cone, bone*.

- ô* (circumflex = *â*), as in *for*.
ô (long obscure), as in *hero*.
ōō (short), as in *book, brook*.
ōō (long), as in *moon, spoon*.
q = *û*, as in *word*.
ô = *ū*, as in *son*.
oe, as in *Phoebe*, = *ē*.

- û* (short), as in *rut, cut*.
û (long), as in *muse, fuse*.
û (circumflex), as in *turn, urn*.
û (long obscure), as in *unite*.

w is a vowel only after a vowel, when it forms the second element of certain diphthongs, as in *few, how*.

- ÿ* (short) = *ī*, as in *hymn*.
ÿ (long) = *ī*, as in *by, cry*.

CONSONANTS

- ε* (hard) = *k*, as in *cat, cape*.
ç (cedilla) = *s*, as in *cell, façade*.
ĝ (hard), as in *dog, gave*.
ĝ (soft), as in *gem, gentle*.
ĥ for the German *ch*, as in *ich, Bach* (*bäk*);
 also = *e*

ü for the German *ü*, as in *Blücher, Grünberg*.

ö for the German *ö*, as in *Göttingen*.

n̄ for the French *n*, as in *bon, Bréton* (*brâ-tôn'*).

th (soft), as in *path*.

TH (hard), as in *the, father*.

ñ for the sound of *ny*, as in *canyon*.

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DAMASCUS

Damascus (*dā-mās'kūs*), capital of the Syrian region of the United Arab Republic, perhaps the most ancient city in the world, called Esh Shâm in Arabic. The Bible mentions it on numerous occasions, connecting it with Abraham and successively with other distinguished men, including St. Paul. It is still one of the largest cities of western Asia, is beautifully situated in a fertile plain of the same name, and is bounded on the north and west by the high mountain range of Anti-Libanus. Jerusalem is located about 140 m. s.w. of Damascus and a railroad line connects it with the Mediterranean Sea at Acre. While possessing many points of interest which are mentioned by travelers, it contains narrow and angular streets, and in the poorer portions has many low houses that are filled with filth. The courts are paved with marble and ornamented with fountains. Many of the public places are adorned with trees and beautified by fine architectural structures. The chief buildings include the citadel and the Great Mosque, built in the 8th century. About 75 mosques of considerable size are maintained in the city, in addition to fully 175 chapels for instruction and prayer.

The Moslems regard Damascus one of the holy cities. Its general features are thoroughly Oriental and it is the gathering place of great companies of pilgrims. Pilgrimages to Damascus began soon after the time of Mohammed, a number of his revelations being associated with it. In several portions are colonies of Christians and Jews, who are allowed religious liberty and educational advantages. Among its notable features are numerous bazaars, the various classes being located by themselves on different streets. Among the bazaars are those of the saddlers, silversmiths, shoemakers, booksellers, and others. In the midst of these stands the Great Khan, which forms a market place for merchants. Straight Street, mentioned in connection with the conversion of St. Paul, is one of the most important commercial thoroughfares.

Much of the trade of Damascus is in the hands of Europeans. Among its products are tobacco, fabrics, silk and cotton goods, jewelry, olive oil, damask, soap, and furniture. Formerly the celebrated Damascus steel was produced largely in the city, but its manufacture is no longer carried on. The population is made up of many classes, including Kalmuks, Turkomans, Afghans, Kurds, Circassians, and Europeans. A large trade is carried on with the interior of Asia by caravans of camels, while within the immediate vicinity it is facilitated by a number of canals. The building of railroads, telephone and telegraph lines, and other modern facilities has increased its importance commercially. Damascus is connected by railroad with El Hammé and Beirut, and by air service with Bagdad. There is a Syrian university with



Courtesy Brown Bros., N. Y.

DAMASCUS

medical, legal, pharmaceutical, and dental faculties. Damascus has been the seat of much military contention and passed successively under the Israelites, Persians, Greeks, and Romans. Damascus' recent history is the history of Syria (*q.v.*). Population, *ca.* 200,000.

Damascus Steel, a kind of steel made originally in Syria, so named from Damascus, where it was used largely in manufacturing cutlery and swords. It has been known to Europeans since the time of the Crusades, but the secret of making the Damascus blades, a kind of sword, is not well understood. Damascus steel is noted for its temper, hardness, and durability. It requires careful forging and workmanship and contains a larger percentage of carbon than ordinary steel. The Damascus blades are beautified by ornamental designs, including inscriptions and landscapes. The art of producing these is called *damaskeening*.

Damask (*dām'ask*), a rich silk fabric originally made at Damascus, from which it is named. It is distinguished by raised figures of animals, landscapes, flowers, and fruits in their natural colors embossed upon a white or colored base. The name is now given to various products made of silk, wool, linen, or cotton, and to a mixture of several of these colored differently. Damask textiles are used for window curtains, fine towels, napkins, tablecloths, and furniture coverings. The figures of fruits, flowers, vases, and other objects placed on the surface are produced by a particular management of the warp threads. Damasks of this character are made extensively in America and Europe.

Damaskinos (*dā-mās'kē-nōs*), Archbishop and former Regent of Greece, born Dobritza, Thessaly, in Greece. He studied theology and law at the Univ. of Athens, served in the Balkan War in 1912, took holy orders in 1917, and was appointed Bishop of Corinth in 1922. He made a

first visit to the U.S. in 1928 to raise funds for alleviation of suffering caused by that year's earthquake disaster, returning two years later as mediator in the selection of a leader for the Orthodox Greek Church in America. In 1938 he was elected Archbishop of Athens and all Greece by the Holy Synod of the Greek Church, but the election was annulled by Premier John Metaxas, and Damaskinos, exiled, returned to a monastery. Recalled by the Synod upon the German invasion of Greece, he fought the enemy with all the instruments of his office, helping to save hundreds of lives and ultimately being placed under house arrest. In 1944, as a result of the strife which followed the liberation, Damaskinos was appointed sole regent. In 1945, following the failure of two cabinets, he also served as premier for two weeks before a new premier could be found. He served as regent until the return to Greece of King George in September 1946.

Damien (*dā-myān'*), JOSEPH DE VEUSTER, Catholic missionary, born at Tremeloo, Belgium, in 1840; died on Molokai Island, Apr. 10, 1889. He became a priest at the age of 19 and gave zealous attention to the church. As a missionary at Honolulu his work was effective, but he soon after devoted his attention to the lepers who had been banished to the island of Molokai, one of the Hawaiian group. He settled among them in 1873, officiating as teacher, physician, magistrate, carpenter, and general assistant. In 1885 the dreaded disease laid hold upon him but he continued his useful service until his death.

Damietta (*dām-ī-ē'l'tā*), a city of Egypt, on the eastern branch of the Nile, about 5 m. from the Mediterranean Sea. The main part of the city is built irregularly, but some of the streets are well improved. It is the seat of several European consuls, a Coptic bishop, and an Egyptian governor. Large vessels cannot ascend the river to Damietta, owing to sand bars at its mouth. It has railroad connections with Cairo and other centers of commerce. The manufactures include clothing, cotton fabrics, and utensils. It was strongly fortified by the Saracens in the time of the Crusades. The construction of the Suez Canal has caused its commerce to decline. Population, *ca.* 30,893.

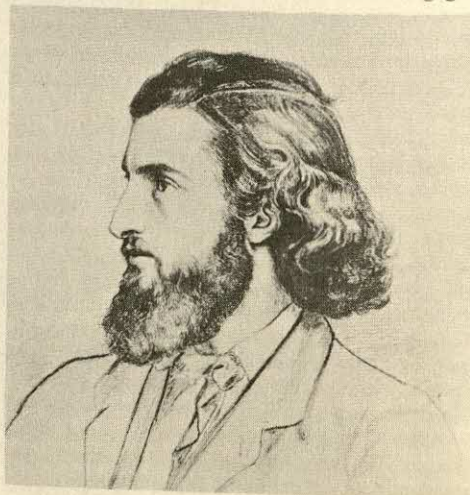
Damocles (*dām'ō-klēs*), a flatterer and courtier of the elder Dionysius, the tyrant of Syracuse. From Cicero we learn that Damocles lauded the happiness of the royalty and that he was reproved by Dionysius in positive terms. While seated at a splendid banquet, surrounded by royal splendor, he looked up suddenly and noticed a keen-edged sword suspended by a horsehair directly over his head. The lesson was a forceful one to teach him the uncertainty of the life and happiness of a king.

Damon and Pythias (*dā'mūn, pith'ī-as*), the names of two celebrated Pythagoreans of Syracuse, whose faithful friendship is proverbial. Dionysius,

the tyrant of Syracuse, had condemned Pythias to die, when he was asked to allow the prisoner to return home to see his wife and children once more. The request was finally granted, but not before Damon pledged his own life for the re-appearance of his friend. In the meantime the river rose on account of great rains and the return of Pythias was delayed, but he appeared at the last moment to save Damon from death. This example of mutual affection so impressed the tyrant that Pythias was pardoned and Dionysius asked to be admitted to their friendship. Upon this historical incident is based the modern fraternal order of the Knights of Pythias.

Damps (*dāmps*), the name generally applied to gaseous products fatal to animal life. Damp frequently occurs in coal mines, wells, and other excavations, especially if they are covered up and unused for some time. *Chokedamp* is composed of carbonic acid mixed with carbonic oxide, being so called from its tendency to extinguish life and fire. *Firedamp* consists largely of light carbureted hydrogen and is so named because of its tendency to explode when mixed with atmospheric air, upon being brought in contact with a flame. *Blackdamp* consists of accumulations of irrespirable gases, mostly nitrogen, which causes the light to burn dimly.

Damrosch (*dām'rōsh*), LEOPOLD, composer and conductor, born at Posen, Germany, Oct. 22, 1832; died Feb. 15, 1885. He was graduated from the Univ. of Berlin, where he received a doctor's degree, and soon established a successful practice in his native city. In 1855 he began to play as a concert violinist, appearing successfully in Magdeburg, and formed the friendship of Liszt. Subsequently he was director of music in Posen and in Breslau; came to the U.S. in 1871, and engaged



LEOPOLD DAMROSCH

Courtesy Musical Courier

as director of the Arion Society in New York City. In 1873 he established the New York Oratorio Society and later the Symphony Society, which he conducted until his death. He was the author of numerous concertos, songs, and cantatas and contributed to numerous periodicals.

Damrosch, WALTER JOHANNES, conductor and composer, born at Breslau, Germany, Jan. 30, 1862; died in New York City, Dec. 22, 1950. At nine he came to the U.S. with his father, Leopold Damrosch, from whom he received much of his musical education. Successor to his father as assistant director of German opera at the Metropolitan Opera (1885) and as director of the New York Oratorio Society and the Symphony Society, he formed the Damrosch Opera Co. in 1894, presenting Wagner's "Parsifal" for the first time in America (1896).

He left the New York Symphony in 1927 to become musical adviser to the National Broadcast-



Photo by R. Jackson, NBC Studios

WALTER DAMROSCH

ing Co. He was noted for introducing an annual series of music appreciation hours and radio symphonic concerts for children. His compositions include the operas "The Scarlet Letter," "Cyrano de Bergerac," and "The Man Without a Country"; "Manila Te Deum," "Death and General Putnam," and many orchestral works and songs. He was president of the American Acad. of Arts and Letters, 1940.

Damson (*dām'sn*), the name of a common plum tree which bears small oval fruit; also the name of the fruit itself. Numerous species have been developed by cultivation. They bear fruit of various colors, such as yellow, bluish, dark purple, and black. They were imported originally from Damascus and are cultivated extensively in the Temperate Zones. Some species are used in making a preserve called *damson cheese*.

Dan (*dān*), the fifth son of Jacob, and ancestor of one of the 12 tribes of Israel. His mother was Bilhah, Rachel's maid. The Danites numbered 62,700 adult males at the time of the Exodus and constituted in point of numbers the second tribe. Samson was a Danite. The tribe lost its identity by mingling with other tribes soon after the time of David. Laish, a city in the northern part of the then Hebrew kingdom, was renamed Dan after the conquest of Canaan. It marked the northern boundary of Palestine, and Beersheba the southern, hence the phrase "from Dan to Beersheba," meaning the whole land of Israel.

Dana (*dā'nā*), CHARLES ANDERSON, journalist, born at Hinsdale, N.H., Aug. 8, 1819; died Oct. 17, 1897. Failing eyesight forced him to give up his studies at Harvard, and he joined the Brook Farm (*q.v.*) community at Roxbury, Mass. In 1847 he went to the New York *Tribune*, where he was managing editor for 14 years, beginning in 1848. He left the *Tribune* after a difference with Horace Greeley (*q.v.*), its editor, concerning the conduct of the Civil War, and after holding a post with the War Dept. served as Assistant Secretary of War from 1863 to the close of the conflict. Subsequently he became editor of the *Chicago Republican*, which soon failed. He organized a stock company in 1868 and bought the New York *Sun*, becoming its editor. As a journalist he was able, sarcastic, and critical, and as a politician he was inclined to be erratic and arbitrary. His ability and industry made the *Sun* a powerful factor in American politics. Among his writings are "Life of Ulysses S. Grant" and "The Art of Newspaper Making." He was editor of the "Household Book of Poetry" and compiler of the "Fifty Perfect Poems," and with George Ripley, he edited "The New American Cyclopaedia," later assisting in its revision.

Dana, JAMES DWIGHT, naturalist, born at Utica, N.Y., Feb. 12, 1813; died April 14, 1895. After studying at Yale Univ., he became a teacher of mathematics at the U.S. Naval Acad. While serving in this capacity, he was sent on an expedition to the Mediterranean for the purpose of making scientific observations. In 1836 he was appointed geologist and mineralogist with the U.S. government expedition to the Pacific, headed by Charles Wilkes (*q.v.*), and recorded his investigations in several scientific reports. Among his works are "The System of Mineralogy," "Corals and Coral Islands," and "Characteristics of Volcanoes."

Dana, RICHARD HENRY, poet and essayist, born at Cambridge, Mass., Nov. 15, 1787; died Feb. 2, 1879. He studied at Harvard for three years, was admitted to the bar, but turned to literature. He became a contributor to the *North American Review* in 1817, remaining with that period-

ical for three years, part of the time as associate editor. His writings were effective in cultivating a literary taste and interest in essays. He delivered lectures on Shakespeare and wrote several poems, among them "The Dying Raven" and "The Bucaneer." His most important works in prose were published in *The Idle Man*, a periodical which he issued.

Dana, RICHARD HENRY, lawyer and author, son of the above, born at Cambridge, Mass., Aug. 1, 1815; died at Rome, Italy, Jan. 7, 1882. He studied at Harvard, but was compelled to abandon attendance at the institution owing to impaired sight, and soon after went to sea, embodying his experiences in his celebrated book, "Two Years Before the Mast." Entering Harvard again, he was graduated in 1837, and, after studying law, was admitted to the bar in 1840. He supported the Republican party from its beginning; was appointed U.S. district attorney (1860). He was a member of the Legislature in 1867-68, but was defeated for Congress by Gen. Butler. Besides contributing extensively to the *North American Review*, he wrote: "The Seaman's Friend," "Memoirs of Edward Channing," and "Memoirs of Washington Allston," and revised Wheaton's "International Law."

Danae (*dān'ā-ē*), in Greek mythology, beloved of Zeus and a daughter of Acrisius, King of Argos. When an oracle predicted that her son would kill his own grandfather, Acrisius confined Danae in a tower of bronze. It was here that Zeus approached her in a shower of gold and she became the mother of Perseus. Great painters such as Rembrandt (1606-69), Correggio (1494-1534), and Titian (1477-1576) utilized this theme. The approach of the lover in the form of a rain of gold became symbolic of mercenary womanhood.

Danaides (*dā-nā'i-dēz*), in Greek legends, the 50 daughters of Danaus, King of Argos. They married their 50 cousins, sons of Aegyptus, and, by the command of their father, who suspected his sons-in-law, they all killed their husbands in one night, except only Hypermnestra, who spared her husband, Lynceus. As a punishment for the murders they were condemned to the lower world and compelled to endeavor to fill with water a vessel full of holes—a never-ending and useless task—in which they were mocked with the delusive hope of ultimate success.

Danbury (*dān'bēr-ī*), a city of Fairfield County, Connecticut, on the Still River, a tributary of the Housatonic. It is on the New York, New Haven & Hartford R.R. and is served by bus lines. Among the manufactures are hats, ball bearings, shirts, medicines, machinery, utensils, and metal goods. It was settled in 1684 and incorporated in 1889. In 1777, it was captured by the British under Gen. Tryon. Population, 1940, 22,339; in 1950, 22,067.

Dance (*dāns*), a rhythmic, patterned movement of the body, usually with musical accompaniment.

The dance had its origin in ritual—the formalized desire to achieve union with those be-



EGYPTIAN DANCERS AND MUSICIANS

From an early Egyptian bas-relief

ings who could bestow immortality upon man. The principal functions of dance through the ages have been the appeasement of or identification with a deity, the expression of sheer physical exuberance, the desire to communicate with another human being or group of human beings, and the symbolizing of the sexual and procreative urges.

The way in which these functions have been expressed has been modified by climate, religious orientation, and social system. The basic patterns in which they are expressed resolve themselves into the circle, the couple, and the processional.

In primitive societies, the dance is coexistent with life. It is used as a means of identification with deities (hence the use of masks). It is used in dramatic presentations of combat and hunting. It is also used as a means of narration or description. Much of African dance is typical of these functions.

In ancient Egypt, the dance lost some of its socializing function. Spontaneity gave way to formalism. The Egyptians, incidentally, regarded their goddess Hathor as the inventor of dance.

The Greeks were a dancing nation. They consecrated a muse, Terpsichore, to the dance. Plato, the Greek philosopher, listed the dance as a necessity in his idea of a republic, and, according to Greek legend, Orpheus journeyed to Egypt to study its dances.

The Greek dance was classified into the Emmelia (grave, noble, proper for invoking the gods); Hyporchemia (lofty and dignified, often accompanied by poetry); Endymatia (brightly costumed, used for entertainment);



Courtesy Metropolitan Museum of Art, N. Y.

GREEK DANCER

Terracotta statue, 3rd century B.C.

and Gymnopaedia (done by nude youths and dedicated to the worship of Apollo). The military dances were either pyrrhic (warlike) or memphitic (more tranquil).

The Greek view of life was aesthetic. The Roman was not. Thus, the dance in Rome became decorative and licentious, and when Christianity was made the state religion, the dance was further discouraged from developing because of the belief that it had Jewish or pagan origins. (This could be traced to such Biblical phrases as "And David danced before the Lord with all his might" . . . II Samuel 6:14, and "if the daughters of Shiloh come out to dance in dances, then come ye out of the vineyards, and catch you every man his wife, . . . and the children of Benjamin did so, and took them wives, according to their number, of them that danced, whom they caught . . . Judges 21:21, 23.)

During the Middle Ages, with the development of capitalism and a lay culture, the dance in the Western world split into three categories—people's dances (including such forms as the passepied, volta, gigue, gavotte, bourrée, branle, and many others); court dances (including the pavane, gaillarde, courante, and sarabande); and religious processions. During the Renaissance, when the laity assumed cultural leadership, the



FLEMISH PEASANT DANCE

Painting by Pieter Breughel, the Elder (1525-69)

dance began to develop as a highly polished theatrical expression. It was in this era that court ballet and, eventually, what is now called classic ballet, were born.

While ballet flourished in the Western world, certain types of ethnic (*i.e.*, treating of races and peoples) dance, nevertheless, maintained their continuity. Typical are the dance of India (mother-style of all Eastern dance), Bali (most highly developed of the forms stemming from the Hindu base), Japan (evolved from the Chinese but more highly developed), and Spain (the only Western nation to develop a complex theatrical form different from ballet).

The mythology of India is centered about Shiva Nataraj, lord of dancers. The root of his

THE HINDU SHIVA NATARAJ

The god dances on a dwarf, symbolizing evil





LA ARGENTINA

Her world tours in dance recitals helped to revive interest in the traditional dances of Spain

dance is primal rhythmic energy. His theater is the cosmos. India is a nation of dancing gods. Its dance is codified in an ancient book called the "*Natya Sastra*" of Bharatha. The book lists endless variations of hand gestures, and movements of head, eyes, eyebrows, face, extremities, and torso. Combined, they form a highly theatrical and elaborate form of art.

The dance of Bali evolved during the Hindu expansion, ca. A.D. 800. It, too, is replete with dancing deities. Its outward style is sharper than the Hindu and full of sudden rhythmic accents. Its stage forms are divided between virtuoso solos, such as the Kebyar, and complex dance-dramas, such as the Legong.

The Japanese dance substitutes an elaborate use of hand props for the hand gestures of India and Bali. Its costuming, too, is highly stylized, with some of the changes taking place on stage. Principal Japanese dance forms are Gagaku (a 7th-century dance-drama of Chinese origin), No (a highly formal dance-drama originating at the end of the 14th century), and Kabuki (which evolved from the No in the 17th century). All of the Japanese forms combine music, dance, stylized pantomime, and vocal intonation.

The basic style of the Spanish dance—the arched back, the arms in counter-line, the castanet rhythm—dates from the Hellenic period (550 B.C.). The sinuous quality of the flamenco dance was added by 15th-century Moorish gyp-

sies. The balletic style of the bolero was added in the 18th century. Today, Spanish dance is divided roughly into the intense flamenco style, originating in Granada; the classic style, taught much the way ballet is in other Western nations; and the sevillanas, originating in Andalusia.

At the beginning of the 20th century, Spanish dancing as an art form had fallen into disrepute. With the advent of La Argentina (Antonia Mercé, 1888-1936), La Argentinita (Encarnación López, 1898-1945), and Vicente Escudero (1889-), it was revived. It was further developed through the performing and extensive touring of many outstanding Spanish dance companies.

The Victorian era had a temporarily inhibiting influence upon the dance in all parts of the world. While the Eastern nations had their traditional forms to fall back upon, the Western nations, notably the U.S. and Germany, underwent a sudden revolution. Prime motivator was Isadora Duncan (1878-1927). Born in California, she was destined to spend most of her creative life in Europe (and briefly in Russia). Yet her influence upon her own country was far-reaching.

Fired not only by the primal simplicity of Greek dance, but by its costuming—which was functional, rather than dramatic—she discarded the shoes and ballet attire of the day. She also found a movement vocabulary—one based upon natural gestures, rather than on the formalized approach of classic ballet.

The Duncan influence in Germany led to what is now called "expressional dance," a form often stark, sometimes violent, but inherently powerful. Mary Wigman (1886-) was its principal

MARY WIGMAN

German expressionist dancer, in "*Die Feier*" (1927)





MARTHA GRAHAM

America's celebrated exponent of contemporary dance, in a scene from "Letter to the World" (1940), based upon the works of the poet Emily Dickinson

protagonist. In a lighter vein, it was also typified by the Viennese artist Harald Kreutzberg (1902-).

Contemporary with Isadora Duncan, but differing in approach, was Ruth St. Denis (1877-), who still performs. An eclectic, she borrowed styles, principally ethnic ones, and combined them in a personal theatrical concept. Her most celebrated dance is "Radha," which had its *première* in 1906.

Ruth St. Denis was for a time professionally associated with her husband, Ted Shawn (1891-), in a company called Denishawn. Little of their repertoire remains, but they exercised a profound influence upon a generation of young Americans who studied with them and who learned that dance need not be the stilted classic dance then taught in schools.

After separating from Miss St. Denis, Shawn formed an all-male group which toured the country and helped break down some of America's taboos against males in the dance. In 1941 Shawn began to manage the Jacob's Pillow School of the Dance, at Lee, Mass. It is a summer project combining dance study and professional programs.

Principal products of the Denishawn movement were Martha Graham (1893-), Doris Humphrey (1895-1958), and Charles Weidman (1901-). Contemporary with them, though not from Denishawn, were Helen Tamiris and Hanya Holm, who now make their principal con-

tributions in the field of musical comedy.

Basic among the modern dancers (as these people were called) was an intense search for new dynamics in movement—not the orderly ballet phrase, but the percussive, noncadenced modern phrase; not dance as a reflection of classic order, but dance as a mirror of the quickened pulse of modern living. They did not attempt to escape from the ground, as ballet dancers did. They fell to the ground and there executed whole phrases.

Instead of fairy tales, their subject matter covered revolution, social pressure, the pace of city living, their personal psyches. Martha Graham, in particular, has ranged widely, from works of social inspiration ("Revolt," 1927; "Deep Song," 1937) to Americana ("Frontier," 1935; "Appalachian Spring," 1944) to satire ("Every Soul is a Circus," 1936; "Punch and the Judy," 1941) to works adding a contemporary viewpoint to classic themes ("Night Journey," 1947; "Cave of the Heart," 1947; "Clytemnestra," 1958).

Doris Humphrey first worked in collaboration with Charles Weidman. Her approach was essentially dramatic, but she also had a firm sense of musical structure. Outstanding works of this period were "The Shakers" (1931), "With My Red Fires" (1936), and "Passacaglia" (1938). After her retirement from active dancing, ca. 1945, she became artistic director of the José Limón Company, producing such works as "Lament for the Death of Ignacio Sanchez

Mejias" (1947), "Day on Earth" (1947), and "Ruins and Visions" (1953).

During and since World War II, the contemporary (as opposed to classic) dance has flourished principally in the U.S. The European countries have turned to fostering their state-owned ballet groups.

Notable among the younger generations of contemporary dancers in the U.S. are José Limón, Merce Cunningham, Sophie Maslow, Jane Dudley, Alwin Nikolais, Valerie Bettis, Sybil Shearer, and Anna Sokolow.

The modern dance has had its influence upon the ballet in the works of Jerome Robbins, Agnes de Mille, Herbert Ross, and John Butler. It has influenced the musical-comedy choreography of Bob Fosse, Michael Kidd, and Jack Cole. Primitive dance, too, has exercised its influence in a style combining Afro-Haitian, modern, and ballet characteristics in an amalgam called modern jazz.

Modern jazz has found wide acceptance on television. In other areas of dance, however, television has not made strong creative advances over other media. It has been content to reflect their trends. See also *Ballet; Choreography*.

AFRICAN DANCER

Asadata Dafora, exponent of African primitive dance, in a solo typical of the west coast of Africa

Courtesy Sunya Shurman



Dancing (*dāns'ing*), SOCIAL, in the modern sense, ballroom dancing, which is essentially designed for couples. Couple dances are historically derived from primitive courtship dancing, various tribal dances, and folk dance forms. The immediate predecessors of modern ballroom dances were the social dances of the royal courts—the gavottes, minuets, pavaues, etc. In the 19th century, the waltz, polka, and mazurka were popularized by noted composers. In the 20th century, Negro rhythms began to influence social dancing, resulting in the two-step, the one-step, and the cakewalk, while South American influences introduced the tango and the rhumba. After the First World War, "hot" or "swing" music, with quick staccato rhythms,



CLASSICAL WALTZ, 19th CENTURY

brought the fox trot and the later "jitterbugging."

Many popular ballroom dances are adaptations of folk dances. Others, including several varieties of jitterbug dances, have been invented by individuals or by schools of dancing. Several types of modern ballroom dances, like such early varieties as the 19th-century round dance, the schottische, break the couple tradition by requiring group participation. Particularly notable is the conga, which features a "line" figure. In addition to the standard social dances which retain their popularity from year to year, specialty dances appear from time to time, some to disappear with a season, others to become a permanent part of the ballroom scene.

Since ballroom dancing is considered a social grace as well as a popular form of enjoyment, it is practiced in many public places—in restaurants, night clubs, hotels, and social clubrooms.



HARVEST MOON BALL

The winners of America's best-known amateur dance contest, the Harvest Moon Ball, are presented each year by Ed Sullivan (left) on his TV show. The charity event, sponsored by the New York Daily News for some 25 years, attracts some 18,000 enthusiasts to Madison Square Garden in New York City. Competitions include fox trot, Viennese waltz, tango, rumba, polka, and rock-'n'-roll

TWO FOR ONE

Consistently in favor with the younger set are the swing dances, variously called Lindy, jitterbug, bop, jive, etc. Although vigorously executed to a steady 4/4 beat, these so-called "spot dances" do not call for progression around the floor as do the classic ballroom dances. This class (right) at Brigham Young Univ., Provo, Utah, is dancing the "Threesome Lindy," a novelty designed for one man and two lady partners



HAWAII GOES LATIN

Teen-agers as well as adults respond to the dance rhythms of the West Indies. Currently the most popular of these is the cha cha, the origin of which is claimed by both Havana and Manhattan. The youngsters have a version all their own, a combination of cha cha and calypso called "Chalypso," which has achieved so much popularity that dance teachers have been obliged to add it to their courses. Here (right) a class in Honolulu performs a Chalypso chain, reminiscent of the conga line



Dandelion (*dān'dè-lī-ūn*), a plant native to Europe, but now common in America. It has a naked, hollow stock, with a composite, bright yellow flower. The leaves rise from a tap root in the form of a bunch. The seed has a white, downy tuft of hair and is scattered extensively by the winds. In many places the dandelion is an obnoxious weed in lawns and parks. Its blanched leaves are recommended as a salad and are eaten like lettuce in form of greens. The plant yields a milky juice, which, in the form of extract, is employed for medicine. Its roots have been used to adulterate coffee in a way quite similar to chicory. Though small in their natural state, the plants have been greatly enlarged and improved by cultivation.

Dandolo (*dān'dô-lô*), the name of a celebrated Venetian family, from which four doges came to the republic. Enrico was the most illustrious of its members. He was born in 1110 and died at Constantinople, Turkey, June 1, 1205. His learning and eloquence caused his rapid political rise, and they were instruments that ultimately led to his election as doge in 1192. While in this office he extended the boundary of the republic. He was a distinguished leader of the third Crusade, at which time he conquered Constantinople, following the murder of Emperor Alexius. Soon after, he established the empire of the Latins and succeeded in securing the election of the Count of Flanders as emperor. His body was buried in the Church of St. Sophia. Several monuments were erected in his honor, but they were destroyed by the Turks in 1453.

Dandurand (*dān-dū-rānd'*), **RAOUL**, politician, born at Montreal, Quebec, Nov. 4, 1861. He was admitted to the bar in 1883. In 1898 he was elected a member of the Dominion Senate, of which he was speaker from 1905 to 1909. After 1921 he was minister without portfolio. In 1925 he was elected president of the Assembly of the League of Nations. He died in 1942.

Dane (*dān*), **NATHAN**, jurist, born at Ipswich, Mass., Dec. 27, 1752; died Feb. 15, 1835. In 1785 he began a three years' service in the Continental Congress, in which he was an influential member. He was elected U.S. Senator in 1794, serving four years, and published "Digest of American Law," a work in nine volumes.

Danegeld (*dān'gēld*), originally a tax on land which was collected by the English kings of the end of the 10th and the beginning of the 11th centuries in order to buy off the invading Danes. It was later continued as a general tax, and was finally abolished by Henry II (1133-89).

Danenhower (*dā'nēn-how-ēr*), **JOHN WILSON**, arctic explorer, born at Chicago, Ill., Sept. 30, 1849; died at Annapolis, Md., Mar. 20, 1887. He was graduated from the U.S. Naval Acad. in 1870, accompanied a surveying expedition to the

North Pacific, and assisted in subduing a rebellion in Honolulu, Hawaii, in 1873. When Gen. Grant visited Egypt, he served on board the *Van-dalia* and joined the *Jeannette* in 1878, which sailed on an Arctic expedition from Havre, France. The expedition passed through Bering Straits and sailed northward in the Arctic Ocean, until the vessels were crushed by ice. The crew left the steamer, and, after dragging their boats over ice for 95 days, embarked in open water, but were separated by a storm. The boat in which Danenhower sought safety entered the Lena delta Sept. 17, 1881, but the others of the crew perished. He arrived in America with several of his crew in June, 1882. The events of this expedition were embodied by him in "The Narrative of the Jeannette."

Daniel (*dān'yel*), one of the four greater prophets of the Hebrews. He was a descendant of a celebrated family of Judah, and was carried in youth as a captive to Babylon with other Hebrews in the third year of Jehoiakim, about 604 B.C. He was brought up in the king's service and was chosen to give instruction in the literature and language of the Chaldeans. After some years he interpreted a dream for Nebuchadnezzar and rose to distinction, being made governor of the province of Babylon and given the office of inspector of the priestly caste. He held this position under Darius and at least until the third year in the reign of Cyrus the Great. His devotion to the worship of God was steadfast and, rather than forsake the teachings of his fathers, he chose to be cast into a lion's den, where he was preserved by angels. Later he assisted his people to return from captivity to their native land.

Daniel wrote one of the most important prophetic books of the Old Testament, which was honored by quotations in the ministry of Christ. It was written partly in Hebrew and partly in Aramaic, and is divided into 12 chapters. The first part is devoted to narratives and the second part to predictions. The history of the Chaldean, Median, Persian, and Macedonian empires is portrayed in the prophecies of Daniel, and they finally terminate in prophecies of the eternal kingdom of Christ. The name Daniel is a Hebrew word, meaning God is judge. While in Babylonian captivity, his name was changed to Belteshazzar, meaning the prince whom Bel favors.

Daniel, **JOHN WARWICK**, statesman, born at Lynchburg, Va., Sept. 5, 1842; died June 29, 1910. He studied at Lynchburg and entered the Confederate Army, serving throughout the war. Later he took up the study of law and began to practice in 1866. He was chosen a member of the Virginia House of Delegates for two terms, later served in the State Senate, and was elected to Congress in 1884. In 1887 he was elected to the U.S. Senate as a Democrat to succeed William Mahone, and was

re-elected in 1893, in 1899, and again in 1905.

Daniell (*dān'yel*), JOHN FREDERICK, celebrated scientist, born at London, England, Mar. 12, 1790; died Mar. 13, 1845. He was a student of Brande and was elected a fellow of the Royal Society in 1814. His inventions include a pyrometer, the hydrometer, and a voltaic battery. The last mentioned, known as the *Daniell battery*, serves as a continuously working battery with a low current.

Daniels (*dān'yelz*), JOSEPHUS, public official, born at Washington, N.C., May 18, 1862. He received an academic education, became state printer, and in 1893 was appointed chief clerk of the Department of the Interior. Subsequently he published the *Raleigh News and Observer*. In 1913 he was made Secretary of the Navy, which position he held until 1921, when he returned to his editorial post. He was American Ambassador to Mexico, 1933-41. He died, Jan. 15, 1948.

Danish West Indies (*dā'nish wēst īn'dēz*), a group of three islands situated E. of Puerto Rico and known as the Virgin Islands (*q.v.*).

Dannat (*dān'at*), WILLIAM T., painter, born at New York City in 1853. After securing a general education and doing work as a painter, he studied in Munich and Paris, and in the latter city was teacher at the Ecole des Beaux-Arts. In 1881 he became a member of the Society of American Artists and in 1889 served on the International Art Jury. The cross of the Legion of Honor was awarded to him in the latter year. His paintings include: "The Quartette," now in the Metropolitan Museum of New York City; "Sacristy in Aragon," in the Chicago Art Museum; and "Lady in Red," in the Luxembourg. A number of his paintings were on exhibition at the Louisiana Purchase Exposition in 1904 and at the Lewis and Clark Exposition, Portland, in 1905. He died in 1929.

Dantchenko (*dān'tchen-ō*), VASILY IVANOVICH NEMIROVICH, dramatist, director and producer, born in Tiflis, Russia, in 1857; died, Apr. 25, 1943. He became interested in the theater while still very young, taking every opportunity to act while also beginning to write novels. He worked for a time as drama and music critic for Moscow and St. Petersburg newspapers, meanwhile publishing several of his books: "Literary Pensioners," "Governmental Inspection," "A Drama Behind the Scenes," and "On the Steppes." He produced his first successful play in 1882, "The Wild Rose," which was followed in quick succession by "The Happy Man," "Gold," "A New Affair," and "The Value of Life." He was put in charge of drama at the Moscow Philharmonic School in 1892, but left that post in 1898 to found the Moscow Art Theater, with Constantin Stanislavsky. This organization grew to be the accepted word on stages throughout the continent, and after the Revolution in 1917 the theater continued to grow in importance. The story

of Dantchenko's work was told in "My Life in the Russian Theater," which he published in 1936.

Dante Alighieri (*dān'tē ā-lē-gyā'rē*), Italian poet of the Middle Ages, born at Florence, Italy, May 14, 1265; died at Ravenna, Sept. 14, 1321. He descended from an ancient family of the lower nobility, was educated under the learned Brunetto Latini, and became familiar with the sciences of his age and with the writings of many famous poets, including Horace, Virgil, and Ovid. At Bologna and Padua he studied philosophy, in which he excelled, and later pursued a course in theology at Paris. He met Beatrice Portinari, the daughter of a rich citizen, when she was only eight years old. The impression made upon him and the love he bore for her were a poetic inspiration ever afterward. She married Simone de Bardi, a nobleman, but died young, in 1290. Dante married Gemma, of the powerful house of Donati, some time after the death of Beatrice. Dante took an active part in military activities, engaging in the battle with the Aretines in 1289, and was present at the capture of Ceprona in 1290. When the factional divisions of the Guelphs (*q.v.*) and Ghibellines (*q.v.*) agitated Florence, he sided with the latter in opposition to the Guelphs, who were strong adherents of the Pope. Dante was sent to Rome on an important embassy to the Pope, and enmity arose between him and Boniface. His absence from Florence gave his enemies an opportunity to secure a decree of banishment against him and he remained in exile to the end of his life. While in exile he traveled extensively, visiting many European cities of note, but after 1320



DANTE ALIGHIERI

he remained mostly with his friend Guido da Polenta, in Ravenna. His death occurred at that city, where his bones are still preserved. His first work, "Vita Nuova," appeared in 1300. It is a poetic collection bearing on his youthful love for Beatrice. His fame rests on his immortal work, "The Divine Comedy."

The republic of Florence set apart a sum of money at the suggestion of Boccaccio about 52 years after the death of Dante. This was expended for lectures in which "The Divine Comedy" was explained to the people in one of the churches, the first lecturer being Boccaccio. Later several other cities followed the same course. "The Divine Comedy" was instrumental in making the Italian language one of beauty, instead of remaining unformed and rude. It has been translated into many languages, translations being estimated at fully 300. The author was spoken of by Boccaccio as a man of medium stature, stooping form, slow in gait and speech, and silent and reserved, but dignified and eloquent when he spoke. Music and painting were objects of his study and devotion.

"The Divine Comedy" was written largely while he was in exile. It has three parts, entitled *Hell*, *Purgatory*, and *Paradise*. The dreams of the poet carry him into a dusky forest, where he is met by the shade of Virgil, who offers to conduct him through Hell and Purgatory. He may not proceed further, but Beatrice shall lead him through the beauties of Paradise. With superb imaginative power the journey through Hell is described, and the characters of guilt and punishment are laid before us with a clearness and earnestness that impress one with awe. He ascends with Virgil to Purgatory and beholds similar scenes, though punishment is but temporary. Virgil now leaves him that he may be taken by Beatrice and led to scenes of surpassing magnificence. Ascending with her into the celestial Paradise, passing over seven spheres, he reaches the eighth, where the triumphant Redeemer is surrounded by a glorious company. Dante feels himself in the presence of divine essence when reaching the ninth; and in the tenth the Deity himself is sitting, but Dante cannot see him for an excess of radiant light.

This wandering of Dante through the three spheres of the cosmos represents only the framework enabling Dante to narrate innumerable scenes all connected with the fates of personalities he encounters during this journey. Traveling through Hell, Purgatory, and Paradise, he selects characters representative of ancient mythology, and of the history of the Church, as well as political figures of his own era, attributing to each of them the qualities he considers most essential. The punishment and rewards are distributed in direct ratio to these qualities.

Although the modern reader is still able to derive enjoyment from the poetical beauty of Dante's stories, it is difficult for him to understand many of the sly hints in the verses in which Dante refers to his contemporaries. There are, however, many passages of such immortal beauty that the philological difficulties recede.

In view of the popularity of "The Divine Comedy" in Italy and elsewhere, it is only natural that this great work has inspired many great artists through the centuries. Some artists have portrayed famous passages in single paintings, while others have produced illustrations for the whole poem. Among the latter, the most famous are Sandro Botticelli (*q.v.*), William Blake (*q.v.*), and Gustave Doré (*q.v.*), whose drawings for Dante's great work have taken their place among the great works of art.

Danton (*dàn-tôn'*), GEORGES JACQUES, revolutionist, born at Arcis-sur-Aube, France, Oct. 28, 1759; guillotined Apr. 5, 1794. He was educated for the profession of law, practiced at Paris, and became an active leader in the Revolution. He was an organizer with Mirabeau, and with Marat and Camille Desmoulins instituted the Cordelier Club, which was the central resort of the revolutionists. The attacks on the Tuileries Aug. 10, 1792, were due largely to his agitation. Soon afterward he was made minister of justice, later a deputy from Paris to the common council, and subsequently president of the committee of public safety. As deputy he voted for the death of Louis XVI and aided in bringing Hébert and others to the scaffold. Early in 1793 he began to lose prestige with the forces he had aroused, and

GEORGES JACQUES DANTON

Drawing by J. L. David (1748-1825)





Courtesy Ewing Galloway, N. Y.

ALONG THE DANUBE. AUSTRIA

the tireless Robespierre became the more influential. He was thrown into prison in 1794, and condemned by the revolutionary party as an accomplice in a conspiracy to restore the monarchy and guillotined. He met death in a defiant manner.

Danube (*dän'üb*), the second largest river of Europe, being exceeded in length only by the Volga. The Grege and the Brigach, two streams originating in the Black Forest of Germany, unite at Donaueschingen and form the Danube. The length is about 1,750 m. and the area drained by it includes 315,000 sq. m. At the union of the two rivers that form it—the height is 2,265 ft. above sea level, the average fall is 18 in. per mile, and its waters flow through a delta of four branches into the Black Sea. The principal tributaries are the Drave, Save, Theiss, and Pruth Rivers. After leaving Germany, it passes through Austria, between which and Yugoslavia it forms a portion of the boundary, thence passes between Yugoslavia and Rumania, thence between Rumania and Bulgaria, and thence makes a bold curve north and east to a point between Rumania and Russia, where its waters unite with the sea. Of its 400 tributaries about 100 are navigable, while Ludwig's Canal connects it with the Rhine and the Moldau and Muhl Canals with the Elbe, and sev-

eral others widen its sphere of commercial importance.

The three principal divisions of the Danube system include the river from its source to Passau, where it leaves German territory; thence the middle course, ending at the Iron Gate, below Orsova; thence the lower course to the sea. The middle course is especially beautiful in scenery, rapids, and cataracts. At the Iron Gate the stream has a width of only 129 yds. and its waters are piled up to a depth of 28 fathoms. At each side great ledges of rock tower above the surface and form a continuous line of beautiful panorama. The delta contains a vast area, equal to about 1,000 sq. m., covered with dense rushes and cut up by winding channels, where sea birds and various animals nest. Three main channels are included in the delta. They are known as the Kilja, St. George, and Sulina mouths, and the last named is the one through which ships enter. The mouths farthest apart are 60 m. from each other. Owing to its favorable location through densely populated regions and to its deep water, the Danube is one of the most important rivers to commerce. Many towns border the river, among them Ulm, Regensburg, and Passau in Germany; Vienna in Austria; Budapest in Hungary, and Galatz in

Bulgaria. Great numbers of steamboats ply the Danube and connect hundreds of commercial centers, total navigation facilities constituting about 2,500 m. From 1921-48 the navigation was controlled by the International Navigation Commission, which is composed of delegates appointed by the states along the river and the Great Powers. This commission made extensive improvements, particularly a great canal at the Iron Gate (*q.v.*).

After the seizure of Austria (1938), Germany dominated the Commission, and expelled the French and British delegates. In 1948 a conference attended by most of the riparian countries, the U.S.S.R., Great Britain, France, and the U.S. provided for a new Danube Control Commission which excluded Germany, Austria, and non-Eastern European countries from membership. The new convention was put into effect by the eastern bloc despite its rejection by the Western Powers, who argued that it violated the long-standing principle that the Danube should be open to all countries on a non-discriminatory basis.

Danvers (*dān'vērz*), a town of Essex County, Massachusetts, about 18 m. N.E. of Boston, on the Boston & Maine R.R. Among the chief buildings are the state hospital for the insane, and the Peabody Institute Public Library. The manufactures include lumber and paper products, shoes, fluorescent lamps, and heating units. In 1692 it was implicated in the Salem witchcraft delusion. Settled in 1627, Danvers was incorporated in 1752. Population, 1905, 9,063; 1940, 14,179; 1950, 15,720.

Danville (*dān'vil*), county seat of Vermilion County, Illinois, on the Big Vermilion River and on the Big Four, the Wabash, and the Chicago & Eastern Illinois R.R.'s. The surrounding country is rich in coal deposits, building material, and fertile soil. Noteworthy buildings include the courthouse, the Carnegie Library, and the Y.M.C.A. Douglas and Lincoln Parks are public grounds. The manufactures include automobile accessories, machinery, electronic equipment, hardware, shoes, and meat and dairy products. It was settled in 1830 and incorporated in 1867. Population, in 1930, 36,765; in 1940, 36,919; in 1950, 37,864.

Danville, county seat of Boyle County, Kentucky, 40 m. S. of Frankfort, on the Southern and other railways. It is the seat of Center Coll., Kentucky School for Women, and Kentucky School for the Deaf. Herrington Lake is 4 m. from the city. It has extensive railway shops. The industries include grain elevators, livestock and lumber yards, tobacco warehouse, and clothing and furniture factories. It is surrounded by a rich agricultural and stock-raising country. Danville was incorporated in 1789. Population, in 1950, 8,686.

Danville, a borough and the county seat of Montour County, Pennsylvania, on the north

branch of the Susquehanna River, 150 m. N.W. of Philadelphia. It is on the Lackawanna, the Pennsylvania, and the Philadelphia & Reading Railroads. The noteworthy buildings include the public library, the high school, the courthouse, the state hospital for the insane, Sacred Heart Villa, and the Geisinger Memorial Hospital. Among the manufactures are stone crushing and coal pulverizing machinery, silk goods, and clothing. The surrounding country is rich in agricultural and mineral products. Population, in 1930, 7,185; in 1940, 7,122; in 1950, 6,994.

Danville, a city in Pittsylvania County, Virginia, on the Dan River, 140 m. S.W. of Richmond. It is on the Danville & Western, the Southern, and other railroads. A leading city in the tobacco and textile industries, it also manufactures knit goods, paints, elevators, rayon fabrics, fertilizers, and food products. Besides fine public schools, it contains the Stratford and Averett Colleges for young women, and an extension of Virginia Polytechnic Institute. First settled in 1792, it was incorporated in 1830, and became a city in 1890. It was the capital of the Confederate States for a short time near the close of the Civil War. Population, 1940, 32,749; in 1950, 35,066.

Danzig (*dān'sik*), a city of Europe (area with surrounding district, 791 sq. m.), prior to the Versailles Treaty capital of West Prussia, on the west branch of the Vistula River, about 3 m. above its mouth at the Baltic. However, its port, Neufahrwasser, is at the mouth of the Vistula. Among the principal buildings is a cathedral built in the 14th century, the Church of St. Catharine. Noteworthy features include the public market, the Langgasse, the city library, and the railway station. The commerce is largely in wheat, amber, machinery, wool, starch, leather, shipbuilding, hardware, clothing, and textiles. The city has railway connections with all parts of Europe. Before World War II, it was the chief outlet for the commerce of Poland.

The first mention of the city was in 997, when it became identified with Christianity. In 1358 it joined the Hanseatic League. It belonged to Prussia from 1793 until 1919, when it was internationalized by the Treaty of Versailles. Claimed by Germany thereafter, Danzig was occupied at the start of the German invasion of Poland (Sept. 1, 1939) and incorporated into the Reich. The Red Army captured Danzig, Mar. 31, 1945, turning the district over to Poland. Its importance to the Germans as a port during World War II is shown by the fact that the Russians captured 45 submarines and 10,000 men with the city. In March 1945, Poland annexed Danzig as "an inseparable part of the Polish Republic." With additional former German lands, the province and city were renamed Gdańsk (area, 4,141 sq. m.). Population of the city, 1950, 193,530.



DANZIG WATERFRONT

Daphnia (*dāf'nī-ā*), a genus of fresh-water crustaceans, known popularly as the water flea. These animals have a bivalve shell, long swimming antennae, and five pairs of feet. A compound eye is attached to the head, which is elongated into a snout. They are abundant in ponds and are important as the diet of many fishes.

Dardanelles (*dār-dā-nēlz'*), the Hellespont of the ancients, so named from Dardanus, the mythical founder of Troy. The strait is 40 m. long and from 1 to 4 m. wide. It divides Turkey, and separates Europe from Asia at this point, connecting the Sea of Marmora with the Aegean Sea. A current flows through it from the Sea of Marmora, which is often increased by winds. The country on the European side is hilly, but is in a high state of cultivation and densely populated, while on the Asiatic side is a fertile plain, rising toward the range of Mt. Ida with gradual ascent. Two castles mark the sites of the ancient Sestos and Abydos, while strong fortifications guard it on both sides. Abydos, on the Asiatic side, is celebrated for the story of Hero and Leander. It is noted for the passage of the armies of Xerxes in 480 B.C., when invading Europe, and that of Alexander in 334 B.C., when leading his famous expedition into Asia. Lord Byron, to demonstrate the possibility of the reputed feat of Leander, swam across the strait.

The Treaty of Lausanne, July 24, 1923, between Turkey and the Allied Powers, provided for the demilitarization of the Dardanelles and the Bosphorus. However, in 1936, a new Straits Conven-

tion at Montreux, Switzerland, granted Turkey the right to refortify the area of the Dardanelles and the Bosphorus, as well as the privilege of prohibiting foreign ships from entering the Dardanelles in an emergency. The right of closing the Dardanelles was exercised by Turkey on Mar. 2, 1941, during World War II. Since the conclusion of that conflict, the Dardanelles have played an important role in international politics; Russia is seeking a stronger influence along the Straits, while the U.S. and England support Turkey in her desire to remain the only defender of the waterway which cuts her country.

Dare (*dār*), VIRGINIA, born Aug. 18, 1587, the first child of English parents born in America. Her parents were the daughter and the assistant of John White, governor of the Roanoke colony of Virginia. The colony disappeared from history after Aug. 27, 1587. The child's recorded life is thus limited to nine days.

Dar es Salaam (*dār' és sà-lām*), seaport and capital of Tanganyika, British East Africa. A railway joins the city with Kigoma, a distance of 780 m. Modern roads connect it with nearby cities, and an airport provides communication facilities with more distant points. The chief exports are copal, rubber, and ivory. The population numbers ca. 100,000, including more than 3,500 Europeans.

Darfur (*dār-fōor'*), the name applied to the western portion of Eastern Sudan, in Africa. It has an estimated area of 200,000 sq. m. and a population of 2,500,000. In 1874 it was reduced

by Ziber Pasha and placed under the control of Egypt. The British claims were strengthened by an agreement with Germany and Italy in 1891. A battle with the French troops at Fashoda resulted in an agreement between France and England, signed Mar. 21, 1899. By the terms of this treaty the western boundary of Darfur is to mark the sphere of influence between the two powers in Central Africa. The district is drained largely by the headwaters of the White Nile and Shari Rivers. It contains large tracts of desert lands in the north, but there are quite productive regions toward the south. Cotton, wheat, tobacco, sesame, maize, and fruits are grown. Cattle raising is the principal industry. A majority of the inhabitants are Arabs, who profess Islam. The government is administered from El Fasher, its capital.

Darien (*dâr-i-ên'*), GULF OF, a gulf extending from the Caribbean Sea, between the Isthmus of Panama and the mainland of South America. It receives the inflow of several rivers, including the Atrato, has a number of seaports, and is the most prominent inlet on the northern coast of Colombia. The southern portion is known as the Gulf of Urabá.

Darien, ISTHMUS OF, the name applied to a neck of land between the Gulf of Darien and the Pacific Ocean, and sometimes to the entire isthmus which connects North and South America, though the name usually applied to the latter is Panama. See *Panama*, *Isthmus of*.

Darien Scheme, a proposition to establish a colony on the Isthmus of Darien with the view of controlling the trade between the western and eastern hemispheres. It was formulated by William Patterson, a Scotchman, in 1695, and about \$4,500,000 was subscribed to finance the scheme. In 1698 about 1,200 colonists sailed from Scotland to their prospective new home, which was called New Caledonia. A second company was sent out in 1699 and a third the following year, but the project proved an entire failure.

Darius I (*dâ-rî'ûs*), or DARIUS HYSTASPIS, the fourth King of Persia, born in 558 B.C. He was a Persian of the Achaemenian line, conspired with six other nobles to murder Smerdis, and became king in 521 B.C. Caution and skill made it possible for him to govern vast dominions for 36 years. When Babylon revolted, he laid siege for two years and brought that fortified city to terms. Later he organized an army of 600,000 men, with which he crossed the Bosphorus by a bridge of boats, intent on conquering the Scythians on the Danube, but retreated and sent an army under Mardonius to invade Greece. The enterprise failed owing to a victory won by the Brygi in Thrace, who cut his army to pieces. Darius promptly organized a second expedition of 500,000 men, but was met by Miltiades with an Athenian army

10,000 strong in the fields of Marathon, in 490 B.C., and was completely defeated. He died in 485 B.C., while engaged in organizing a third expedition.

Darius II, King of Persia, natural son of Artaxerxes I. He was surnamed Nothus and assumed the name of Darius. His reign was characterized by weakness and rebellions among his satraps. He ascended the throne in 423 and died in 404. He was succeeded by his son, Cyrus the Younger, who exercised much influence in the last years of the Peloponnesian War in Greece.

Darius III, surnamed Codomannus, the 12th and last King of Persia. He was a great-grandson of Darius II. His reign began in 336 B.C. and ended with his death (330). At the time he ascended the throne, his kingdom was greatly disturbed by the tyranny and luxury of his predecessors and was soon overwhelmed by the advancing opposition of the Macedonians. His army was defeated on the banks of the Granicus in Asia Minor. Soon after he organized an army of 400,000 to intercept the advance of Alexander the Great in the mountains of Cilicia, but was defeated a second time, in the battle near the Issus (333 B.C.), when his family fell into the hands of Alexander. He collected another army and met the Macedonians (331 B.C.) but was again defeated. Shortly after, Alexander captured Susa, the capital, and made all Persia subject to Greece. Darius was slain as the result of a conspiracy (330 B.C.), and with his death the Persian Empire came to a close. His daughter, Statira, became a wife of Alexander.

Dark Ages (*därk 'ä'gez*), the name applied to a portion of the Middle Ages, including a period of about 1,000 years, from the fall of Rome to the revival of letters in the 15th century. The period properly commences with the invasion of France by Clovis (486 A.D.), and closes with the invasion of Naples by Charles VIII in 1495.

Dark Continent, name popularly applied to Africa.

Darlan (*där-län'*), JEAN L.K. FRANCOIS, naval officer and politician, born in France in 1881; died in 1942. Entering the French navy at 21, he rose to the rank of rear admiral (1929), was appointed vice-admiral (1932), and chief of naval staff (1936). He commanded all French naval forces (1939-40). Marshal Pétain (*q.v.*) appointed him admiral of the fleet (June 1940), vice-premier (Feb. 1941), and head of all armed forces (Aug. 1941). After he was forced to relinquish his post as vice-premier (Apr. 1942) to Pierre Laval (*q.v.*), he was sent to Africa to watch over French possessions on that continent. However, shortly after Anglo-American forces landed there (Nov. 1942), he revoked the order for resistance and cooperated with the Allied command, assuming the post of High Commissioner for

French Africa. What his final course would have been could never become clear because a month later he was assassinated.

Darley (*dār'li*), FELIX OCTAVIUS CARR, artist, born at Philadelphia, Pa., June 23, 1822; died Mar. 27, 1888. After securing a public school education, he clerked in a mercantile establishment in Philadelphia and began to produce humorous sketches and book illustrations. Among his productions are about 500 drawings for the works of Fenimore Cooper. He made illustrations on stone for Irving's "Legend of Sleepy Hollow" and "Rip Van Winkle." A number of his drawings were reduced to appear on bank notes and government bonds. He resided in Europe from 1864 to 1868. After returning to America, he published: "Illustrations to Evangeline," "Sketches Abroad with Pen and Pencil."

Darling (*dār'ling*), a river in Australia, the largest tributary of the Murray. It is formed by the confluence of several rivers rising in the Liverpool Range, has a length of 600 m., with its tributaries 1,150 m., and drains an area of 197,500 sq. m. Its confluence with the Murray is at Wentworth, on the boundary between Victoria and South Australia. The name is applied to two districts in Australia, the Darling District and the Darling Downs. The former is in New South Wales and the latter in Queensland.

Darling, GRACE HORSLEY, famous heroine, daughter of William Darling, keeper of the Longstone lighthouse, born at Bamborough, England, Nov. 24, 1815; died Oct. 20, 1842. A severe storm on Sept. 6, 1838, had wrecked the *Forfarshire*

shore. Many honors were accorded to her on account of this noble feat, besides which she received a purse raised through public subscription.

Darling Range (*dār'ling rānj*), a chain of mountains in the western part of Australia, extending parallel with the coast for a distance of nearly 300 m. The highest summit, Point d'Entrecasteaux, has an altitude of 3,700 ft. The general altitude ranges from 1,200 to 1,500 ft., and many sections of this range are covered with fine forests.

Darmstadt (*därm'shtät*), a city of Hesse, Germany, situated on the Darm River, 15 m. s. of Frankfurt-on-Main. It is the converging center of several railroads and has a large trade. The city contains a museum of rare paintings and a library of 500,000 volumes. The manufactures include hats, carpets, chemicals, clothing, and earthenware. Following World War II it was placed in the American occupation zone. Population, ca. 88,000.

Darnel (*dār'nēl*), an annual cornfield weed, belonging to the genus of the rye family.

Darnley (*därm'li*), HENRY STUART, LORD, born in 1545; slain in Scotland, Feb. 9, 1567. Son of the Earl of Lennox, he married Mary, Queen of Scots. The marriage proved a very unfortunate one, on account of which he is chiefly known. After the birth of his son, who subsequently became James I of England and VI of Scotland, he was stricken with smallpox at Glasgow, and later was conveyed to an isolated house by Mary, where he was confined for some time. The dwelling belonged to Bothwell, who afterward married Mary, and was blown into the air by powder, killing Darnley and several others. It is thought that Bothwell was involved in the crime.

Darrah (*dār'rā*), MRS. LYDIA, heroine, celebrated in the history of the American Revolution. Little is known of her early life, except that she was a Quaker and resided in Philadelphia, Pa. When the British army planned to attack the American army under Washington, then at Whitmarsh, on Dec. 4, 1777, she had obtained information of the intended attack, procured a permit from Gen. Howe to pass the British lines with the understanding that she wanted to get some flour for her family, but at night walked several miles in the snow to inform Col. Craig of the plans of the British. She returned at night without any one knowing of her mission. When the British moved against Washington they found him ready to meet them; hence the attack proved a failure.

Darrow (*dār'ō*), CLARENCE SEWARD, lawyer, born in Kinsman, Ohio, April 18, 1857; died in Chicago, Ill., March 13, 1938. Admitted to the bar in 1878, he began to practice in Chicago in 1888,



GRACE DARLING

with 53 persons on board at Harker's Rock, among the Farne Islands. The wreck was seen from the lighthouse by Grace Darling. Through the heroic efforts of the maiden and her father nine persons were rescued and brought safely to



CLARENCE DARROW

Courtesy Brown Bros., N. Y.

serving as defense counsel in such celebrated cases as the trial of Eugene V. Debs (*q.v.*) after the Pullman strike (1894), the Leopold-Loeb murder trial (1924), the Scopes trial (*q.v.*), and the Scottsboro case (*q.v.*). In 1927 Darrow gave up his regular practice in favor of lecturing and writing. His works include "Farmington" (1904), a fictionalized account of his childhood, "Crime, Its Cause and Its Treatment" (1922), "The Story of My Life" (1932), and many articles on socioeconomic issues.

Darter (*därt'ēr*), the name of a group of small fishes found in the fresh waters of North America, so named from their quick motion. These fish belong to the perch family, are from 6 to 10 in. long, and are classed among the smallest spiny rayed fish. They frequently lie concealed under stones at the bottom of clear running water, and when hungry or frightened dart suddenly for a short distance. Several species are familiar, most of them frequenting the streams of the central and southern parts of the U.S.

Darter, or **Snakebird**, a bird native to the tropical parts of most continents, closely allied to the cormorant. The feet are webbed, the bill is longer than the head, and the neck is long and slender. They are called darter because of their quick motion. The name *snakebird* is applied to them because the head is scarcely thicker than the neck, giving it the appearance of a snake. When frightened while sitting on a branch over a stream, they dart quickly into the water or fly upward and circle in the air like a hawk. They are skilled in catching fish, at which they dart with a sudden and well-directed aim. The American darter is sometimes called *water turkey* and is about 3 ft. long.

DARWIN

Dartmoor (*därt'mōor*), an extensive and desolate upland in Devonshire, England, belonging to the Duchy of Cornwall. It is noted because of its rugged scenery and as the source of several rivers. A large portion of it furnishes grazing for cattle and sheep during the summer months. The extent is 14 m. from east to west and 20 m. from north to south, with an area of 150,000 acres. The minerals include china clay and tin. At Lee Moor, which is the seat of a meteorological observatory, are the largest kaolin works in England. A number of earthworks, Cyclopean bridges, and stone antiquities abound. A prison was built on the Dartmoor upland in 1809 for the custody of French prisoners of war. The British captured about 2,500 American sailors during the War of 1812, confining them in this prison until peace was concluded. The prison covers about 30 acres and has been famous in history and fiction.

Dartmouth (*därt'mūth*), a seaport in South Devon, England, on the west side of the Dart estuary, the entrance of which is defended by a battery. Now chiefly a coaling station, Dartmouth was once a famous seaport, noted for its fisheries. It is the site of the Royal Naval Coll. Population, *ca.* 6,500.

Dartmouth College, an institution of higher learning at Hanover, N.H. It is the outgrowth of a school which was established at Lebanon, Conn. (1754), for the Christian education of Indian youth. This school was founded by Eleazer Wheelock and was known as Moor's Indian Charity School, so named from Josiah Moor, who contributed a house and two acres of land. The college received a royal charter in 1769, hence is one of the oldest of New England colleges, ranking next to Harvard and Yale. John Wentworth, the governor of the Province of New Hampshire, gave to the college the name of Lord Dartmouth, who was its most active patron in Great Britain, but he and other Englishmen who contributed to its support withdrew their patronage soon after it ceased to be devoted particularly to the education of Indians. The departments include those of medicine, classics, sciences, commerce and finance, and civil engineering. It has a library of over 500,000 volumes and pamphlets. With it are associated the Dartmouth Medical School (founded in 1798), the Thayer School of Civil Engineering (founded in 1867), and the Amos Tuck School of Administration and Finance (established in 1900). The enrollment approximates 3,000; the number of faculty members is about 350.

Darwin (*där'win*), CHARLES ROBERT, noted naturalist, son of Dr. R.W. Darwin, born at Shrewsbury, England, Feb. 12, 1809; died Apr. 19, 1882. He was a grandson of Erasmus Darwin, a naturalist, and developed an early interest in the natural sciences. In 1825 he entered Edin-

DARWINISM

burgh Univ., which he attended two years, and in 1831 received a degree at Cambridge. Soon after graduating he joined a hydrographical survey in the South American waters as naturalist. He sailed on the *Beagle* and spent five years in studying the flora, fauna, and geology of many temperate, subtropical, and tropical districts. In 1838 he was appointed secretary of the Geological Society and the next year was elected to the Royal Society. In the meantime he married his cousin Emma Wedgwood. While on his voyage of investigation, he kept a careful account of observations and published them in the "Journal of Researches." About the same time he published "Zoölogy of the Voyage of the *Beagle* from 1840 to 1843." He settled in Down, Kent, three years after his marriage and devoted himself to the pursuit of scientific study for the rest of his life. His work entitled "On the Origin of Species by Means of Natural Selection" was published in 1859. In this treatise he attempted to prove that all the forms of plant and animal life are evolved from common ancestors, and that evolution is due to natural selection, in which the fittest survive in the struggle for existence.

The concept of evolution had been put forth by several earlier authors, but because Darwin produced so much evidence in favor of his theory of evolution and cleared up the reason for evolutionary change through his theory of natural selection, he must be given credit for its final acceptance. Darwin was noted for his honesty of purpose, affable character, devotion to his conception of truth, and persistent habits of study. Although best known for his study of evolution, Darwin was a many-sided naturalist, who made important contributions to geology (origin of coral reefs), zoological geography (island fauna), taxonomy (barnacles), botany (orchids), ecology, and animal breeding.

Among his writings, besides those named above, are: "The Structure and Distribution of Coral Reefs," "The Descent of Man," "Geological Observation in South America," "Fertilization of Orchids," "Insectivorous Plants," "Cross and Self-Fertilization in the Vegetable Kingdom," "Formation of Vegetable Mold," "Emotions in Man and Animals," "Principles of Variation Under Domestication," and "The Power of Movement in Plants." See also *Evolution*.

Darwinism (*dār'win-izm*), a term used to designate the views advocated by Charles R. Darwin (*q.v.*), on the origin of species of plants and animals, and to organic evolution in general. Darwin amassed an enormous number of facts which contradicted the belief that each species was individually created. He also presented a theory which explained the mechanism by which evolution operates. This theory of *Natural Selection* is based on three facts: (1) All organ-



CHARLES DARWIN

isms have the tendency to increase in a geometrical ratio. (2) In spite of the capacity of increase, the number of a given species remains more or less constant. Obviously then, a high percentage of the progeny of any species is eliminated in the struggle for existence. (3) The individuals of a species are not identical; in fact, there are many variations, even among the descendants of the same parents. Since there is struggle for existence, and since individuals are not alike, those individuals with the most favorable combination of characteristics will survive. There is thus a selection of the fittest, and a continuous improvement of the species from generation to generation.

It is erroneous to use Darwinism and organic evolution synonymously, since there were many students of evolution who did not believe in the theory of natural selection. Darwinism is only one of the theories that explain organic evolution.

Darwin did not succeed in explaining the origin of the variability found in nature. Genetics, the science of heredity, has filled in this gap since 1900. A combination of Darwin's ideas on natural selection, with the findings of modern genetics, is called "Neo-Darwinism." See also *Evolution*.

Dasyure (*dās'i-ūr*), the common name of a genus of marsupial animals native to Australia and Tasmania. They are allied to the opossums. Most species are spotted and have bushy tails. The dasyure of Tasmania is light brown or whitish beneath, gray and whitish above, and about 2 ft. long. It lives in burrows, feeds on insects and flesh, and is particularly fond of poultry. Several species of Australia resemble the cat and are quite strong and fierce. Fossil remains of the dasyure are found in many sections of South America.

Date (*dāt*), the common name of the fruit borne by a number of species of trees which belong to the genus *Phoenix dactylifera*. The tree itself is known as the date tree or date palm. It is the palm tree mentioned by classic writers and in the Scriptures. It is indigenous to India, South-western Asia, and Northern Africa, where it still flourishes, serving a useful purpose in the domestic and commercial life of the inhabitants. The trees have a straight stem, from 25 to 60 ft. in height, and are of nearly the same thickness throughout the entire length. Date palms are divided into male and female, the former usually numbering about one in 25 when found in palm groves. The pistillate trees bear from 150 to 200 dates. In the larger species the bunches of dates weigh from 20 to 25 pounds, hanging below the leaves, at the top of the tree. The Arabs are among the most extensive producers, propagating them from suckers. In the eighth year they begin to bear. They reach maturity at about 25 and decline after growing fully 100 years.

The fruit of the date tree is eaten fresh or is preserved by drying. Large cakes are made of dates by pounding and kneading them together, and these form the principal food of the Arabian caravans that traverse the deserts. Some species are used in the making of wine and a sort of vinegar. The date stones or seeds are ground and fed to camels, or are used as a substitute for coffee. A valuable oil is obtained from the seeds, while in some countries they are used in making ornaments and charms. Baskets, bags, and pouches are made from the leaves; while the fibers found

near the bottom of the tree are used for making rope, and the wood is valuable for fencing and building purposes. The fruit of several species grown in California and Arizona is used in the manufacture of toddy (a pleasant beverage). The date palm, next to the coconut tree, is the most interesting and useful of the palms.

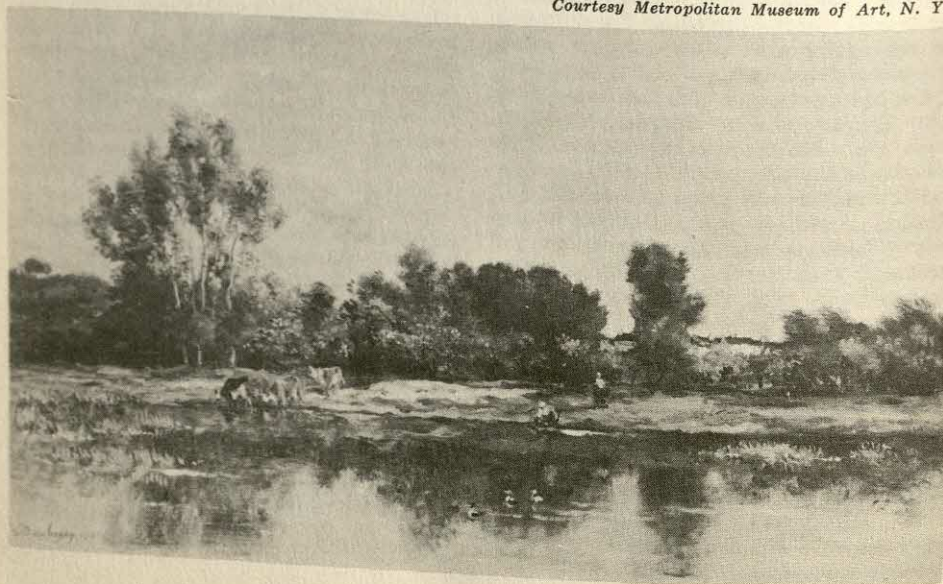
Date Plum, the name of several species of trees of the ebony family, usually large, thick-leaved, and hard-wooded. The low-growing date plum tree of Europe produces a small fruit. It is native to the southern portion of that continent. The American persimmon, or date plum, attains a height of from 40 to 60 ft. Its fruit is about an inch in diameter, is nearly round, very hard, and eatable after being frosted. The date plum of China is cultivated for its fruit (which resembles a small apple in size), and is used in making preserves.

Dative (*dā'tiv*), in grammar, the case of the noun which designates the remoter object or the recipient; in the English language it is usually formed by adding the prefix *to* or by understood use of the word, *e.g.*, Peter gives *Mary* a book, or Peter gives a book *to Mary*; in either sentence *Mary* is in the dative case.

Daubigny (*dô-bē'nyē*), CHARLES FRANÇOIS, landscape painter, born at Paris, France, Feb. 15, 1817; died Feb. 19, 1878. He studied under Paul Delaroche and began to exhibit in the Salon at an early age. In 1857 he was made chevalier of the Legion of Honor, in which he became an officer in 1874. His paintings are very numerous and are praised for their fine effect of light and

LANDSCAPE BY CHARLES DAUBIGNY

Courtesy Metropolitan Museum of Art, N. Y.





Courtesy Metropolitan Museum of Art, N. Y.

THIRD CLASS CARRIAGE. PAINTING BY HONORÉ DAUMIER

shade. They include: "On the River Oise," "The Valley of Optevoz," "The Apple Orchard," "Beech at Villerville," and "The Sheepfold."

Daudet (*dō-dā'*), ALPHONSE, dramatist and novelist, born at Nîmes, France, May 13, 1840; died Dec. 16, 1897. He was educated at the Lyons Lycée. When 17 years of age, he went to Paris, where he became an appointee in the office of the Count of Morny, then president of the legislative corps. His first book, a work on poetry, was published in 1858, by which he gained a wide reputation, and was soon after employed as a writer on several newspapers. Among his best known works are: "Tartarin of Tarascon," "Jack," "Sapho," "The Immortal," "The Sacrifice," and "Robert Helmont."

Daudet, LÉON, novelist, born in Paris, 1867; died in 1942. Son of Alphonse Daudet, he was a prolific writer. After serving on several newspaper staffs, he founded (1907) with Charles Maurras, the royalist journal, "L'Action Française." Active in monarchist circles throughout World War I, he was elected by Rightists to the Chamber of Deputies (1919-24). Arrested (1927) for implicating the police in the murder of his son, he made a sensational escape from prison into Holland, returning to France (1929).

His varied writings include the novels, "L'Astre Noir" (1893), and "Sylla et son Destin" (1925); the psychological work: "Le Monde des Images" (1919); the political studies, "L'Avant-Guerre" (1913), and "L'Agonie du Régime" (1925);

literary criticism, and "Mémoires" (1913-22).

Daugavpils (*dou'gāf-pēlz*), a city and former fortress of Latvia (*q.v.*), in the U.S.S.R., 120 m. s.e. of Riga; situated on the Dvina River and on the trunk railway to Warsaw and Leningrad. The modern city is a marketing center for produce and lumber. It was founded by Teutonic knights in the 13th century. German troops occupied the city during World War II until 1944, when they were expelled by the Russians. Population, ca. 45,000.

Daughters of the American Revolution, a society of women, descendants of the soldiers and sailors of the Revolution, organized at Washington, D.C., on Oct. 11, 1890. The purpose is to perpetuate the memory of those who fought upon the American side in the War of Independence, to promote the erection of monuments, and to encourage the collection of relics. The society was incorporated in 1896 by Act of Congress, to which it reports annually. In 1902 a site was purchased at Washington, D.C., on which among other structures the Memorial Continental Hall (1910), Administration Building (1923), and Constitution Hall (1929) were erected. The average membership is 145,000, organized into chapters in all of the states, territories and possessions of the U.S., and in some foreign countries. About 4,000 members attend the society's annual convention in Washington.

Daumier (*dō-myā'*), HONORÉ, artist, born in Marseilles, France, Feb. 20, 1808; died

in 1879. Often called the Michelangelo of caricature, he published his early drawings in the comic journal *La Caricature*. In 1832, Daumier's cartoon of King Louis Philippe (1773-1850) as Gargantua landed him in prison for six months. Nevertheless, he continued to ridicule bourgeois society and to stress the miseries of the poor. Among his caricatures some of the most famous are the "Third Class Carriage" and "The Washer-woman." Although less known, his paintings show great power; for example, "Christ and His Apostles," and "Don Quixote and Sancho Panza."

Dauphin (*də'fin*), the eldest son of a French king, prior to the revolution of 1830. The title was originally held by the lords of Viennois, whose province was called Dauphiné. It was first assumed about the middle of the 9th century. The last lord ceded the province to the French king (1349), on the condition that the title should be forever borne by the heir apparent. The title was abolished after the revolution of 1830, however. The wife of a dauphin was called a dauphine or dauphiness.

Davenport (*dāv'en-pōrt*), a city of Iowa, county seat of Scott County, on the Mississippi River and on the Chicago, Burlington & Quincy, the Chicago, Rock Island & Pacific, the Chicago, Milwaukee & St. Paul, and other railroads. Across the Mississippi is Rock Island, Ill., a beautiful island several miles long, with which it is connected by two bridges. The public buildings include the county courthouse, a Federal building, the city hall, the public library, Mercy and Davenport hospitals, St. Ambrose Coll., and the Masonic Temple. The city has several parks, including Le Claire, Duck Creek, and Lindsay. It has a number of fine public schools and churches, a state home for orphans, and the Palmer School of Chiropractic. Rock Island is owned by the U.S. government, and is the seat of an arsenal and of military headquarters.

Davenport is important as a commercial center. It has regular steamship communication with ports on the Ohio and the Gulf. Among the manufactures are aluminum, clothing, furniture, flour, railroad cars, chemicals, cement, lumber products, agricultural implements, buttons, and woolen goods. It has large interests in shipping grain and in slaughtering. It was founded in 1836 and named after Col. George Davenport. In 1838 it was incorporated as a town and in 1851 as a city. Population, 1930, 60,751; 1940, 66,039; 1950, 74,549.

Davenport, EDWARD LOOMIS, actor, born at Boston, Mass., Nov. 15, 1814; died Sept. 1, 1877. After securing an education, he took training for both tragedy and comedy. While popular in America and Europe, he was less accomplished than his daughter, Fanny. He married Fanny Vining, an English actress, in 1849, and was ac-

companied by her in his starring engagements. His plays were mostly Shakespearean, but he appeared in others and in several of his own authorship.

Davenport, FANNY LILY GIPSY, actress, born in London, England, Apr. 10, 1850; died in Duxbury, Mass., Sept. 26, 1898. Daughter of the well-known actor, Edward L. Davenport, she commenced her stage career at the age of 14, after attending public school in Boston. She achieved much success under Augustin Daly and ranked among the foremost actresses in high comedy. Besides appearing in Shakespearean comedies, she acted in emotional plays, among them "Theodora," "Cleopatra," "Fedora," and "Camille." In 1879 she married Edwin F. Pierce, but was divorced from him, and soon after married Melbourne MacDowell. While her art was high, the success achieved was due partly to her personal attraction.

Davenport, MARCIA, author and music critic, born New York City, June 9, 1903. After studying at a French school in Philadelphia and at Wellesley Coll. (1921-23), she received her B.A. from the Univ. of Grenoble, France. She joined the staff of *The New Yorker* in 1928, remaining there until 1931, and during that period married the writer, Russell Wheeler Davenport. Her first book, "Mozart," published in 1932, was translated into French, German, Spanish and Portuguese. Her second novel, "Of Lena Geyer," was biographical, written while she was a commentator on the Metropolitan Opera radio concerts. She was also music critic for *Stage Magazine* (1934-39). Her most celebrated book, "The Valley of Decision," was written during a period when she lived in Pittsburgh, Pa., and she spent two years interviewing steel mill managers and union heads



Courtesy Charles Scribner's Sons, N. Y.

MARCIA DAVENPORT

DAVENPORT

to acquire a sound knowledge of the steel industry. In 1947 she published a novel about New York City, "East Side, West Side," and in 1954, "My Brother's Keeper," based in part on the story of the Collyer brothers, two New York recluses.

Davenport, RUSSELL WHEELER, author, editor, born in South Bethlehem, Pa., July 12, 1889; died in New York City, April 19, 1954. He was the son of Russell W. Davenport, vice-president of the Bethlehem Steel Corp. After driving an ambulance in World War I, he attended Yale Univ., winning his A.B. in 1923. That same year he joined the staff of *Time Magazine*. He left to do reportorial work, later became a staff member of *Fortune* (1930-37), managing editor of that publication (1937-40), and chairman of the board of editors (1941). In 1940 he was personal advisor and chief of research for Wendell Willkie in the Presidential campaign of that year. He was for a time chief of research for the Office of Civilian Defense and (1942-44) chief editorial writer for *Life Magazine*. His "My Country: A Poem of America" (1944) marked him as a leader among the more liberal elements of the Republican party; and "The Dignity of Man" was posthumously published (1955).

Davey Jones, name signifying the evil spirit ruling beneath the ocean waters.

Davey Jones' Locker, figure of speech designating the ocean as the place in which the drowned are buried. Thus to go to "Davey Jones' Locker" means to drown or to be buried at sea.

David (*dā'vid*), "the beloved," second King of Israel, known and venerated by Christians, Jews, and Mohammedans. The exact date of his life is not completely agreed on. Historical research places him between 1055 B.C. and 970 B.C. The fact that David, the youngest son of Jesse, was born in Bethlehem and descended from the Jewish tribe of Judah is of great importance, for in the life of Christ we are continually reminded of the tradition of David and Christ's descent from the princes of Judah. We learn about David through the Chronicles, the Books of Samuel, and indirectly through the Psalms, some of which he was supposed to have written. Some historical data may also be found in the work of pre-Christian pagan historians, in Flavius Josephus (*q.v.*), and in some Apocryphal writings, wherein the Jewish tradition is preserved.

The story of David's life is explicitly told in the above-mentioned parts of the Old Testament. Although as the youngest son, he was brought up in the lowly calling of a shepherd, his agility and courage began to attract attention very early. At the instance of Samuel, who seems to have discovered him, young David was ordered to the court of King Saul and commanded to play his harp to relieve the depressions of the king. The



DAVID

Marble statue by Donatello (1386?-1466)

relationship between the aging ruler and the young boy has provided a theme for many poetic writings and works of art, among the most famous of them, Rembrandt's "David and Saul." From this time on, David was in some way connected with the court of Saul, but he grew in importance only after his appointment to a command in the army. In particular, he distinguished himself in a battle with the Philistines by challenging the Philistine giant, Goliath, to single combat and slaying him with polished pebbles from his shepherd's sling. This incident also became the subject for artistic works such as the

marvelous sculptures of Michelangelo and Cellini. After his victory over Goliath and the consequent glorification of his person, David found that King Saul gradually grew envious and fearful of him. Saul had given his daughter, Michal, in marriage to David, and a close friendship had grown between David and the king's son, Jonathan, but Saul believed that David agreed with Samuel and the party of priests who were hostile to the newly founded kingdom of Saul. The more mad Saul grew, the more dangerous became David's life. David fled, first to Samuel, and then to caves outside Bethlehem, where he led the life of an outlaw. During this time he led armed forays against neighboring tribes and was obliged to defend himself from Saul. Finally, he joined King Achish of the Philistines. In one of the ensuing battles both Saul and Jonathan were killed, and David returned to his country as King of Judah, later becoming King of all Israel. David moved the capital from Hebron to Jerusalem, creating the City of David, new capital of all the realm. He developed an orderly government and a well organized army with which he conquered many neighboring tribes, including the Philistines, the Moabites, the Syrians, the Edomites, and the Ammonites. Thus, David became a ruler like the great oriental sovereigns of Egypt and Persia. Although his empire later declined, the very existence of this worldly empire gives a special color to the religious history of the Jews. The tremendous progress of the internal administration, the unification of dominions which extended from the Euphrates to Egypt, the concentration of treasures acquired through conquest, the centralization of religious culture, all of these things made Israel temporarily one of the most powerful and prosperous empires of the ancient world. In the latter part of David's reign, which lasted 33 years, fears of dangers from outside and the abuses of the harem system began to create a certain discontent among the people. Two rebellions were led by his sons, Absalom and Adonijah, the latter because David had decreed as his successor, Solomon, David's son by Bathsheba (*q.v.*).

David, with all his cruelty and typically oriental despotism, with accompanying misuse of royal power on numerous occasions, is, nevertheless, one of the most touchingly human figures of the Old Testament. A great ruler who was at the same time a great poet and a sage, he developed his people in a political sense as no one else had done before. Most important of all, he enriched the civilization of the land and deepened the religious consciousness of his people.

David I (SAINT DAVID), King of Scotland, born in 1084; died in Carlisle, May 24, 1153. The youngest son of Malcolm Canmore and St. Margaret, he became ruler of the Kingdom of Scotland in 1124. Married to Matilda, daughter of

Henry I and grandniece of William the Conqueror, he invaded England in defense of his wife's claim to the English throne, but was defeated at the Battle of Northallerton (Battle of the Standard) in 1138. He founded bishoprics, built castles, and in various other ways forwarded the process of feudalizing the country.

David (*dā-vēd'*), JACQUES LOUIS, painter, born at Paris, France, Aug. 31, 1748; died Dec. 29, 1825. He studied at Paris and Rome and visited many of the European centers of art. His works include many productions in the classic styles. In the Revolution he became prominent in politics, and as a member of the convention voted for the



Courtesy Wm. Rockhill Nelson Gallery, Kansas City, Mo.

PAINTING BY JACQUES LOUIS DAVID

Portrait of a Young Boy

death of Louis XVI. Being a Jacobin and a member of the Committee of Safety, he was twice imprisoned after the fall of Robespierre. Napoleon appointed him first painter in 1804 and gave him a number of commissions. After the fall of Napoleon, to whom he was greatly attached, he was banished and died in exile in Brussels. His greatest work undoubtedly is "The Rape of the Sabinas." Other productions include: "The Death of Socrates," "The Oath of Horatio," "Paris and Helen," "Brutus Condemning His Son," "The Wrath of Achilles," and "Mars Disarmed by Venus."

David, PIERRE JEAN, sculptor, born at Angers, France, Mar. 13, 1789; died Jan. 5, 1856. He is generally known as David d'Angers. After studying sculpture in Paris, he spent some time in Rome in company with Canova and Thorwaldsen, and in 1816 returned to France. He acquired a high reputation by producing the sta-

tue of the Prince of Condé, a work indicating the movement toward a realistic method in art as against the prevailing classical style. Shortly after the revolution of 1830 he began work on the Pantheon, the pediment of which he filled with sculptures. He made statues of Cuvier and Racine, medallions of Napoleon and Mme. David, and busts of Goethe and Washington, and produced many portraits in bas-relief. In 1848 he was elected a Republican member of the National Assembly.

Davidson (*dā'vid-sūn*), GEORGE, geodetist and astronomer, born in Nottingham, England, May 9, 1825; died Dec. 1, 1911. As a member of the U.S. Coast and Geodetic Survey, he charted the



Courtesy Museum of Modern Art, N. Y.

BRONZE BUST BY JO DAVIDSON

Portrait of La Pasionaria

Pacific coast for navigation and surveyed the Alaskan coast. Davidson also directed the observations of the transit of Venus and made valuable studies of star positions and meteors.

Davidson, JO, sculptor, born in New York City, March 30, 1883; died in Berchères, France, Jan. 2, 1952. He attended Yale Medical School for a short time, but left to take up the study of sculpture. After studying at the Art Students' League, he won the Hallgarten Scholarship and went to Paris in 1907, where he gave his first exhibit two years later. Except for brief visits to the U.S., he remained in France until just before World War I. Going to England, he achieved immediate success and was soon commissioned to do busts of such famous people as Lord Northcliffe, Rabindranath Tagore, and Joseph Conrad. He returned to France at the outbreak of war and became a war correspondent. Describing himself as a "plastic historian," Davidson probably

executed more portrait busts of famous personalities than any other sculptor before him. The list of his sitters includes President Franklin D. Roosevelt, Benito Mussolini, Mahatma Gandhi, Walt Whitman, George Bernard Shaw, and Will Rogers. His art is characterized by the condensed masses he built up, and by the compression of volume.

Davidson, JOHN, poet, born in Barrhead, Scotland, April 11, 1857; died (probably by suicide) in Penzance, Cornwall, March 23, 1909. He worked in the chemical department of a sugar refinery when 13 years of age, subsequently attended Edinburgh Univ., and was teacher in the schools of Scotland for several years. His literary productions include a number of plays worthy of notice: "Smith: A Tragic Farce" (1888) and "Scaramouch in Naxos" (1889). He moved to London in 1889 and secured a reputation as a poet (e.g., "Fleet Street Eclogues"). His last work of merit was a series published under the general title of "Testaments" (1901-08). Written in blank verse, they were marked by strong materialistic pessimism.

Davies (*dā'vēz*), ARTHUR BOWEN, painter, born in Utica, N.Y., Sept. 26, 1862; died in Florence, Italy, Oct. 24, 1928. A student of the Art Inst. of Chicago and of the Art Students League in New York, Davies showed in his canvases a conspicuous transition from romanticism to naturalism and later to symbolism, approaching abstract art. His works, of which many hang in museums throughout the U.S., include "The Girdle of Ares," "Maya," and "Along the Erie Canal."

Davies, JOSEPH EDWARD, lawyer, born in Watertown, Wis., Nov. 29, 1876; died in Washington, D.C., May 9, 1958. After receiving (1901) his LL.B. from the Univ. of Wisconsin, he practiced law, ultimately attaining an international reputation. He served as U.S. Commissioner of Corporations (1913-15) and was U.S. ambassador in Moscow (1936-38) and in Brussels (1938-39); he also acted as adviser at the Potsdam Conference (1945). His book "Mission to Moscow" (1941), which was later filmed, is a record of his years in the U.S.S.R.

Davies, SIR LOUIS HENRY, Canadian jurist, born in Charlottetown, Prince Edward Island, May 4, 1845; died May 1, 1924. He was admitted to the bar (1866) and became solicitor general (1869). In 1876-79 he was premier and attorney general of Prince Edward Island. Davies was elected to the Parliament of Canada as a Liberal in 1882, serving continuously about 20 years. He was minister of marine and fisheries for Canada (1896-1901) and thereafter a member of the Canadian supreme court and of the Privy Council. He represented Great Britain at several Anglo-American negotiations concerning fishery and other questions.

Davies, WILLIAM HENRY, poet, born in Newport, Monmouthshire, England, April 20, 1871; died in Nailsworth, Sept. 26, 1940. He quit school early and spent several years wandering idly in England and America. Nature and the hardships of the poor are the main themes of his many books, which include "The Soul's Destroyer" (1907), "Nature Poems" (1908), and "A Poet's Calendar" (1927).

Da Vinci (*dā vĕn'chĕ*), LEONARDO. See *Vinci*.

Davis (*dā'vis*), BENJAMIN OLIVER, soldier, born in Washington, D.C., June 1, 1877. The grandson of a slave who bought his freedom in 1800, Davis was educated at Howard Univ. During the Spanish-American War he was commissioned a first lieutenant. After the war he re-enlisted as a private and rose through the ranks to become (1940) the first Negro general in the U.S. Army. Retiring in 1941, he was recalled in 1945, during World War II, and served until 1948 as inspector general of Negro troops in Great Britain, when he again retired.

His son, OLIVER BENJAMIN DAVIS, JR., soldier, was born in Washington, D.C., on Dec. 18, 1912. He attended Western Reserve Univ. and the Univ. of Chicago before entering West Point, from which he was graduated in 1936. During World War II he flew 50 combat missions as a fighter pilot in command of the 332nd fighter group in Italy. He was made a colonel in 1950 and a brigadier general in 1954, the first Negro general in the Air Force. In 1959 he was promoted to major general.

Davis, BETTE (RUTH ELIZABETH), film actress,



BETTE DAVIS

Wide World Photo

born April 5, 1908, in Lowell, Mass. Educated at Cushing Acad., Ashburnham, Mass., she began her career as a motion-picture actress in 1931, winning almost immediate acclaim. Twice she was named the best actress of the year by the Motion

Picture Acad. of Arts and Sciences, in 1935 for her portrayal in "Dangerous," and in 1938 for "Jezebel." Equally applauded have been her roles in such films as "Of Human Bondage," "The Petrified Forest," and "All About Eve."

Davis, CHARLES HENRY, naval officer and scientist, born in Boston, Mass., Jan. 16, 1807; died in Washington, D.C., Feb. 18, 1877. As a naval commander during the Civil War, he was responsible for two Union victories which practically annihilated the Confederate fleet, and, as a result of these, he was appointed a rear admiral. Davis later devoted himself to science, becoming chief of the Bureau of Navigation and director of the Naval Observatory. His son, CHARLES HENRY DAVIS (1845-1921), also followed a naval career, becoming a rear admiral in 1904.

Davis, DAVID, statesman and jurist, born in Cecil County, Maryland, March 9, 1815; died June 26, 1886. A graduate of Kenyon Coll. and the Yale Law School, he established a successful practice at Bloomington, Ill. From 1848 to 1862 Davis was presiding judge in Illinois' famous eighth judicial circuit, in which courts the young Abraham Lincoln practiced. Friend and colleague of the future President, Davis managed the campaign which secured Lincoln's nomination in 1860 and was later appointed by President Lincoln a justice of the U.S. Supreme Court. One of his opinions, *Ex parte Milligan*, has become one of the most important decisions in the civil liberties field, denouncing, as it does, the use of arbitrary military power. Although the National Labor Reform party nominated him for President (1872), he withdrew

DAVID DAVIS

Brown Brothers



when he lost the nomination of the Liberal Republicans. In 1877 he left the bench to become U.S. Senator from Illinois.

Davis, ELMER (HOLMES), journalist and radio news commentator, born in Aurora, Ind., Jan.

13, 1890; died in Washington, D.C., May 18, 1958. A graduate of Franklin Coll., Franklin, Ind., he was (1912-14) a Rhodes scholar at Oxford Univ. He was a staff member for ten years (1914-24) of the *New York Times*, where he distinguished himself as a writer and correspondent. As a news commentator for the Columbia Broadcasting System (1939-42) and the American Broadcasting Co. (1945-53), Davis gained wide acclaim. In World War II, he was head (1942-45) of the Office of War Information, a Federal agency for the distribution of information relating to the war effort. Among his many books, which include several novels, were "History of The New York Times, 1851-1921" (1921), "Giant Killer" (1928), "Not to Mention the War" (1940), "But We Were Born Free" (1954), and "Two Minutes Till Midnight" (1955).

Davis, HENRY WINTER, statesman, born in Annapolis, Md., Aug. 16, 1817; died Dec. 30, 1865. He was graduated from Kenyon Coll., Ohio, studied law at the Univ. of Virginia, and practiced law in Baltimore. In 1854 he was elected to Congress, serving until 1861, and was again a member of Congress in 1863-65. He was first a Whig, then supported the American party, and finally became a Republican. During the war he favored the Union and advocated the abolition of slavery. He was chairman of the Committee on Foreign Affairs from 1863 until 1865.

Davis, HERBERT JOHN, educator and author, born in Long Buckby, Northamptonshire, England, May 24, 1893. He was educated at Oxford,

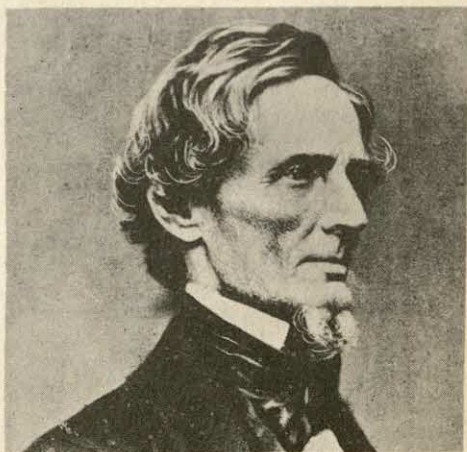
at the University Coll. Made a full professor in 1935, he was later (1937 *et seq.*) professor and head of the English department at Cornell Univ. Davis was president of Smith Coll. in 1940-49, returning to Oxford as a reader in textual criticism in 1949. An authority on Jonathan Swift, he began to edit the complete prose works of Swift in 1938, to be published in 14 volumes. He also published several single volumes on Swift and his works, *e.g.*, "Swift's View of Poetry" (1931), "Stella, a Gentlewoman of the 18th Century" (1942), and "The Satire of Jonathan Swift" (1945).

Davis, JAMES JOHN, Senator, born in Tredegar, Wales, Oct. 27, 1873; died in Tokoma Park, Md., Nov. 22, 1947. He came to the U.S. in his early youth. He became head of the Loyal Order of the Moose in 1906 and greatly promoted the order's growth. He was Secretary of Labor, 1921-30, and served in the Senate, 1930-45.

Davis, JEFFERSON, statesman, Secretary of War, president of the Confederate States of America, born in Todd (formerly Christian) County, Kentucky, June 3, 1808; died in New Orleans, La., Dec. 6, 1889. When he was three years of age, his family moved to Mississippi, where Davis attended private schools. After studying at Transylvania Coll., Kentucky, he was graduated (1828) from West Point and served in frontier garrisons for seven years. Contrary to her father's wishes, he married Sarah Knox Taylor, daughter of the future President Zachary Taylor. The young couple settled on a plantation near Vicksburg,

HERBERT J. DAVIS

Courtesy Ralph Wing Studio



Courtesy Brown Bros., N. Y.

JEFFERSON DAVIS

receiving his M.A. in 1919, after serving as a gunner and rising to lieutenant in the British army in World War I. He was a lecturer at the Univ. of Leeds in 1920 and went to Toronto, Canada, in 1922 as associate professor of English

Miss. Within three months his bride died of fever, and Davis quietly managed his plantation for ten years. In 1845 he married Varina Howell and also became a U.S. Representative (Democrat) to Congress from Mississippi. He commanded the

"Mississippi Rifles" in the Mexican War and achieved distinction in the battles of Monterey and Buena Vista, while serving under Taylor, his former father-in-law. In 1847 Davis resigned his commission to accept an appointment to the U.S. Senate and three years later was elected for a full term. He led the Southern nationalists in upholding the legal rights of slaveowners and reluctantly voted for the Compromise of 1851. In that same year he resigned from the Senate to run against Henry S. Foote for the governorship of Mississippi, but he was defeated. As Secretary of War in the cabinet of President Pierce, Davis reached the apex of his national statesmanship. He reformed and strengthened the Army, provided for surveys of Western railroad routes, and became, except in name, the leader of the Pierce administration. After 1857 he again represented the Southern point of view in the U.S. Senate.

By 1861 he was not the ardent secessionist of earlier years, for he feared the possibility of civil war. However, he resigned from the Senate after the secession of Mississippi (Jan. 9, 1861) and accepted command of his state's troops. His military career ended with his election and inauguration as president (Feb. 18, 1861) of the provisional government of the Confederacy. He was elected in October for a term of six years and inaugurated as president (Feb. 22, 1862) at Richmond, Va. Davis selected a cabinet composed of men of ability or, in some cases, to satisfy claims of powerful states. He demonstrated his executive ability by securing men and material for defense, and in part his leadership was responsible for the showing the South made against a superior North. He was often in conflict with governors of the states, who insisted on guarding their states' rights. The failure to secure foreign recognition, plus military defeats and inflation, made Davis unpopular. He was severely criticized by the Southern press and by the congress, but he maintained control of that body until the end. His relations with Gen. Robert E. Lee were excellent, but Gen. Albert S. Johnston (*qq.v.*) was a caustic critic. The sensitiveness of Davis to criticism and his poor health were serious handicaps. In his own sincerity and desire to achieve independence, he too often failed to distinguish between constructive and destructive criticism. After the fall of Petersburg, Va. (April 1865), Davis and the cabinet went southward. He was captured by Federal troops on May 10 at Irwinville, Ga., and was imprisoned in Fortress Monroe for two years.

For a time he was a shackled prisoner, and his treatment won him the sympathy of Southerners. Although indicted for treason, he was never tried. For more than 20 years after the war, he engaged in various and unsuccessful business enterprises. He was in demand as a speaker, and both his speeches and his writings, including "The Rise

and Fall of the Confederate Government," were defenses of the Southern cause and the Confederacy.

Davis, JOHN CHANDLER BANCROFT, jurist and diplomat, born in Worcester, Mass., Dec. 29, 1822; died in Washington, D.C., Dec. 27, 1907. He was elected to the New York state legislature in 1869. President Grant appointed him Assistant Secretary of State. After representing the U.S. in the Alabama Claims (*q.v.*) arbitration at Geneva, Switzerland, he resumed his post as Assistant Secretary of State. He was minister to Germany (1874-77), later became a judge of the U.S. court of claims, and was made Supreme Court reporter in 1883.

Davis, JOHN WILLIAM, lawyer and statesman, born in Clarksburg, W. Va., April 13, 1873; died in Charleston, S.C., March 24, 1955. Admitted to the bar in 1895, he became a teacher of law at Washington and Lee Univ. and practiced law at Clarksburg from 1897 to 1913, when he moved his law practice to New York City. He served in Congress (1911-15), representing the first district of West Virginia, and in 1918 became Solicitor General of the U.S.

A vigorous liberal until the New Deal era, and a leading corporation lawyer, Davis argued 140 cases before the Supreme Court, more than any other lawyer in U.S. history. Woodrow Wilson named him ambassador to Great Britain (1918-21). After being nominated at the Democratic party convention on the 103rd ballot, he ran for the Presidency in 1924, against Calvin Coolidge. In 1952 he again gained national recognition by representing the steel industry before the U.S. Supreme Court in its suit against President Truman's seizure of steel mills to forestall a strike.

Davis, NATHAN SMITH, physician, born in Greene, N.Y., Jan. 9, 1817; died June 16, 1904. He taught at Rush Medical Coll. (1849-59). A founder of the medical department of Lind Univ. (which became the Northwestern Univ. medical department) he was also a member of its faculty. He was influential in founding the American Medical Association.

Davis, NORMAN H., diplomat and financier, born in Bedford County, Tennessee, Aug. 9, 1878; died in Hot Springs, Va., July 2, 1944. He was educated at Vanderbilt and Stanford universities. In 1902 he began his career in Cuba with banking and sugar enterprises. In 1917 he became adviser on foreign loans to the U.S. Secretary of the Treasury and, in 1919, U.S. finance commissioner to Europe. He was an American member of the Allied Armistice Commission, chairman of the finance section of the Supreme Economic Council, and financial adviser to President Woodrow Wilson. He served as Assistant Secretary of the Treasury (1919-20) and as Undersecretary of State (1920-21). He was a member of the American delegation to the Inter-



TYPES OF DOGS I

Top row, left to right — Non-Sporting Dogs: Chow Chow, English Bulldog
Middle row — Toys: Pekingese, Chihuahua Bottom row — Working Dogs: Collie, Boxer



TYPES OF DOGS II

Top row, left to right — Sporting Dogs: Cocker Spaniel, English Setter
 Middle row — Terriers: Skye Terrier, Scottish Terrier Bottom row — Hounds: Greyhound, Dachshund

DAVIS

national Economic Conference at Geneva (1927), a U.S. delegate to the Disarmament Conference at Geneva (1932-33), and headed the American delegation at the London Naval Conference (1935). Appointed chairman of the American Red Cross in 1938, he held this position until his death on July 2, 1944.

Davis, OWEN, playwright, born in Portland, Me., Jan. 29, 1874; died in New York City, Oct. 14, 1956. He studied at Harvard Coll. (1890-92) before beginning to write his more than 100 melodramas and farces. A more serious play, "Icebound," won the 1923 Pulitzer Prize. Davis' most successful works were "The Nervous Wreck" (1923), "Lazybones" (1924), "Beware of Widows" (1925), "Easy Come, Easy Go" (1925), "The Ninth Guest" (1932), and "Mr. and Mrs. North" (1941).

Davis, REBECCA BLAINE HARDING, novelist, born at Washington, Pa., June 24, 1831; died Sept. 29, 1910. She contributed stories to the *Atlantic Monthly* and was associate editor of the *New York Tribune* (1869-75). Among her publications are "A Law Unto Herself" (1878), "Natasqua" (1886), "Kent Hampden" (1892), and "Dr. Warrick's Daughters" (1896).

Davis, RICHARD HARDING, novelist and journalist, born at Philadelphia, Pa., Apr. 18, 1864; died Apr. 11, 1916. He was the son of Rebecca H. Davis (*q.v.*) and was educated at Lehigh and at Johns Hopkins Univs. He was a reporter for the *Philadelphia Record* and the *New York Sun* and became managing editor of *Harper's Weekly* in 1890. His books include "Stories for Boys," "Van Bibber and Others," "Our English Cousins," "The Princess Aline," "Soldiers of Fortune," "The West From a Car Window," "Cuban and Porto Rican Campaigns," "With Both Armies in South Africa," and "The Bar Sinister."

Davis, STUART, artist, born at Philadelphia, Pa., Dec. 7, 1894. He studied at the Henri School of Art, New York (1910-13), and in 1913 exhibited six water colors in the Armory Exhibition, New York. In World War I he executed maps for Army Intelligence. During his first visit to Europe (1928) he spent some time painting in Paris. He taught at the Art Students' League (1931-32) and in 1940 joined the staff of the New School of Social Research, New York. A leading abstractionist painter, Davis is represented by murals in Radio City Music Hall (1932), in Radio Station WNYC (1939), and in the Communications Building at the New York World's Fair (1940). Paintings by Davis are in the Museum of Modern Art and the Whitney Museum of American Art, in New York, and in many other galleries throughout the U.S.

Davis, VARINA ANNE, novelist, called the "Daughter of the Confederacy," born at Richmond, Va., June 27, 1864; died Sept. 18, 1898.



Courtesy American Red Cross

NORMAN H. DAVIS

She was the daughter of Jefferson Davis and was born while he was in the State House of the Confederacy. Her novels include "The Veiled Doctor" (1895) and "A Romance of the Summer Seas" (1899).

Davis Cup, international lawn tennis trophy, donated by an American, Dwight F. Davis.

The first matches were played in 1900, at the Longwood Cricket Club in Boston and were won by a team representing the U.S. The trophy was not competed for in the years 1901, 1915-18, 1940-45. United States teams did not contend in 1912 and 1919, but won the trophy in 1913, 1920-26, 1937-38, 1946-49, 1954, and 1958. Since 1938 competition has been between Australia and the U.S.

Davisson (dā'vī-sun), CLINTON JOSEPH, physicist, born in Bloomington, Ill., Oct. 22, 1881; died in Charlottesville, Va., Feb. 1, 1958. Educated at the Univ. of Chicago, he was an instructor of physics at the Carnegie Inst. of Technology (1911-17) and worked with Bell Telephone Laboratories (1917-46). In 1937 he shared with Sir George Thomson (*q.v.*) the Nobel Prize in physics for his part in the discovery of the wave diffraction of electrons by crystals.

Davis Strait, the portion of the sea which separates Baffin Island from Greenland and connects Baffin Bay with the Atlantic Ocean. The width is from 200 to 500 m. An Arctic current flows southward through this strait and passes along the Atlantic coast of America. It was discovered in 1585 by the English navigator, John Davis (1550?-1605).

Davitt (dāv'it), MICHAEL, Irish patriot, born in Straide, Ireland, Mar. 25, 1846; died May 31, 1906. His parents were tenants and were evicted from their farm in 1850 because they were unable to pay rent. He was a factory hand in the cotton mills at Haslingden, where he lost his right arm, and at the age of 15 went to work in a printing office. In 1865 he joined the Fenians (*q.v.*) and



CHARLES G. DAWES

Courtesy Brown Bros., N. Y.

was sentenced to 15 years' imprisonment for attempting to transport arms into Ireland, but was released in 1877. In 1879, with C.S. Parnell (*q.v.*) and others, he organized the Irish Land League and the following year he toured the U.S. to organize an auxiliary Land League. He was imprisoned again in 1881 and a third time in 1883 for his violent and seditious speeches for home rule. In 1882 he was elected to Parliament, but was not allowed to serve. In 1893 he was again elected to Parliament but was compelled to vacate on account of bankruptcy, and was again elected in 1895, serving until his resignation in 1899. After 1890 his extremist views made him an opponent of Parnell's parliamentary approach to the problem of home rule. His publications include "Defense of the Land League" (1891), "Life and Progress in Australasia" (1898), and "The Fall of Feudalism in Ireland" (1904).

Davy (*dā'vī*), SIR HUMPHRY, chemist, born in Cornwall, England, Dec. 17, 1778; died May 29, 1829. He attended school at Truro and Penzance until 15 years of age, studied chemistry, and later became an assistant in the Medical Pneumatic Institution at Bristol. His experiments, of which he made many, were largely in gases. In 1799 he discovered that pure nitrous oxide, or "laughing gas," was respirable, and he recorded the fact that he breathed 16 quarts of it for almost seven minutes. Accounts of his researches established a reputation that led to his appointment as professor of chemistry at the Royal Institution of London (1802-12), where his chief interest was in electrochemistry. He also began researches in agricultural chemistry and discovered that alkalis and earths are compounds formed by a union of oxygen with metallic bases.

Davy succeeded in preparing potassium and sodium by the process of electrolysis in 1807. Later he determined the nature of chlorine and

DAWSON

discovered calcium, strontium, boron, and barium. After being knighted in 1812, he traveled in Europe where he received many honors. He returned to England in 1815 and later investigated the nature of firedamp, the explosions of which had caused much damage in mines. These investigations led to his invention of the safety lamp (1815). He was granted a baronetcy in 1818 and became president of the Royal Society in 1820. His writings include "Elements of Agricultural Chemistry," "On Some Chemical Agencies of Electricity," and "Elements of Chemical Philosophy."

Dawes (*dā'z*), CHARLES GATES, statesman, born at Marietta, Ohio, Aug. 27, 1865; died in Chicago, Ill., April 23, 1951. He graduated from Marietta Coll. (1884) and from Cincinnati Law School (1886) and was admitted to the Nebraska bar (1886). In 1898 he was campaign manager for McKinley, who made him his Controller of the Currency at Washington (1897-1902). He served on the General Purchasing Board during World War I, was director of the Federal budget system, and was head of the Reparations Commission which devised the Dawes Plan, which put the German reparations on a commercial basis, a feat for which he shared in the Nobel Peace Prize of 1925. In 1924 he was elected Vice President of the U.S. He was ambassador to England (1929-32) and then became president of the Reconstruction Finance Corp. From 1938-45 he was a director of the Radio Corp. of America. He has published a number of essays and books, among them "A Journal of Reparations" and "Journal as Ambassador to Great Britain."

Dawson (*dā'sūn*), a city of Canada, formerly capital of the Yukon Territory. It is situated at the confluence of the Klondike and Yukon Rivers, about 330 m. n.w. of Skagway, 1,400 ft. above sea level. The surrounding country is a gold-mining region. Dawson's importance dates from 1896, when gold was discovered on Bonanza Creek. The chief buildings include a number of schools and churches, several theaters, a public library, and the buildings occupied by government officials. Transportation is chiefly by steamers on the lower and upper Yukon. It was named for George Mercer Dawson (*q.v.*). Population, 1951 (est.), 800.

Dawson, GEORGE MERCER, geologist, born at Pictou, Nova Scotia, Aug. 1, 1849; died Mar. 2, 1901. His father was Sir John W. Dawson (*q.v.*). George Dawson was educated at McGill Univ. and the Royal School of Mines, London. In 1873 he was appointed geologist and botanist to the Northwest Boundary Commission and in 1875 joined the Geological Survey of Canada of which he was director (1895-1901). He was leader of the expedition which made the first extended ex-

ploration of the Yukon valley (1887-88). In 1891 he served with the British Bering Sea Commission in its investigation of North Pacific seal life. He wrote a number of reports on his expeditions and surveys.

Dawson, SIR JOHN WILLIAM, geologist, born at Pictou, Nova Scotia, Oct. 30, 1820; died at Montreal, Nov. 20, 1899. He graduated from Edinburgh Univ. (1842) and returned to Nova Scotia where he accompanied Sir Charles Lyell on geological expeditions and made studies of the fossil forests of the coal measures. In 1850 he was made superintendent of education for Nova Scotia and in 1855 he was appointed principal of McGill Univ. and professor of natural sciences, which positions he held until 1893. He was knighted in 1884 and became first president of the Royal Society of Canada. He was a vigorous opponent of Darwin's theory of evolution. His publications include "The Dawn of Life," "The Story of the Earth and Man," "Geological History of Plants," "Fossil Men and Their Modern Representatives," "The Origin of the World," "The Chain of Life in Geological Time," "Handbook of Canadian Geology," and "Modern Ideas of Evolution."

Day (*dā*), the term employed originally to distinguish the time of daylight from the space of night or darkness, but now used more frequently to denote the complete alternation of light and darkness caused by an entire rotation of the earth upon its axis. Because the earth is a sphere, only one-half of its surface can be in the light of the sun at once. Night occurs in the half away from the sun. The two phases, day and night, cover equal portions of the earth's surface, and together constituting 24 hours. The alternations of light and darkness are caused by the rotation of the earth upon its axis, and, on account of this rotation, the several portions of the surface have each a proportional share of light and darkness. The length of each varies at different seasons of the year, owing to the continual parallelism of the axis of the earth to any former position. The fact that different portions of the earth's surface are being turned consecutively toward the sun constitutes the cause of both the change of seasons and the variations of the length of day and night.

A *solar day* is measured from the sun's coming to the meridian and again returning to it. Owing to the revolution of the earth around the sun, the solar day varies in length. It is about four minutes longer than the *sidereal day*. The latter is measured by the time of a star's coming to the meridian and returning to it on the immediate subsequent night. The mean solar day is 24 hours, and the mean sidereal day is 23 hours, 56 minutes and 4.098 seconds. This difference is due to the sun's apparent movement at a slow rate to the east through the stars, by which they reach the meri-

dian in a shorter time than the sun does, if estimated by sun time. The interval existing between two successive transits of the sun across the meridian is called an *apparent day*, while the *astronomical day* is a day beginning, since January 1885, at noon and extending to the next. It is divided into 24 hours, not into two periods of 12 hours each. The day at the Equator is always 12 hours, while the longest day at the poles is six months. On Mar. 21 and Sept. 21 the days and nights are equal in all parts of the earth.

In different countries the day is counted to begin at different times. The Jews begin the day at sunset and the Babylonians began it at sunrise; the Egyptians and Romans counted from midnight, which is the basis used by most modern peoples. The Latin *post meridiem*, meaning afternoon, is abbreviated by writing P.M.; and *ante meridiem* (forenoon), by writing A.M. These are necessary on account of dividing the common clock time, or day, into two portions of 12 hours each. In military practice, the day is divided into 24 hourly periods, the afternoon and night periods being designated from 13 to 24 o'clock. *Daylight saving time* is a plan to conserve one hour of daylight by setting clocks one hour ahead of standard time.

Day, JAMES EDWARD, lawyer, government official, born in Jacksonville, Ill., Oct. 11, 1914. He was graduated from the Univ. of Chicago (1935) and Harvard Law School (1938). Adlai E. Stevenson (*q.v.*), then governor of Illinois, appointed Day state insurance commissioner in 1950. He joined the Prudential Insurance Co. of America in 1953 and in 1957 was made a vice president, in charge of Western operations. In 1958, as a California resident and Democrat, he became interested in state politics; in 1961 he was appointed U.S. Postmaster General by President John F. Kennedy.

Day, WILLIAM RUFUS, jurist and statesman, born at Ravenna, O., Apr. 17, 1849; died July 9, 1923. He graduated from the Univ. of Michigan in 1870 and, after studying law, was admitted to the bar in Ohio. In 1886 he was elected judge of the Court of Common Pleas of the ninth judicial district. He succeeded John Sherman as Secretary of State (1898), having previously served as assistant secretary, and in the same year resigned to become chairman of the U.S. Peace Commission in Paris, which made a treaty to terminate the war with Spain. He was appointed U.S. circuit judge in 1899. In 1903 he was made an associate justice of the Supreme Court by President Roosevelt and served until his death.

Day Lily (*dā lī'lī*), a genus of plants of the lily family, native to Europe and Asia. Several species are cultivated in the flower gardens of America, especially the fragrant yellow day lily. These plants include many species that are noted for the variegated colors of their flowers. The

leaves are long and grow from the ground and the stem is branching. In some parts of Europe the day lily is cultivated to furnish food for cattle.

Days of Grace (*dāz of grās*), in commerce, additional time allowed to make payment after the day on which a negotiable bill, such as a check, draft, note or bond, falls due. In the U.S., the common practice has been to allow three days of grace, though some states have abolished it entirely.

Dayton (*dā'tyn*), a city in Ohio, county seat of Montgomery County, on the Great Miami, Mad, and Stillwater rivers, ca. 55 m. n. of Cincinnati, Ohio. It is served by the Baltimore & Ohio, Erie, New York Central, and Pennsylvania R.R.'s. The James M. Cox Airport is 10 m. n. of the city.

With an area of 25 sq. m., the city lies 745 ft. above sea level. There are more than 20 parks, covering ca. 1,400 acres. Among places of interest are Newcom Tavern (1796); Old Court House (1850), a fine example of Greek revival architecture; the home of the poet Paul Laurence Dunbar, since 1938 a state memorial; and the Wright Memorial. Nearby are Miamisburg Mound and Ft. Ancient, examples of the ancient culture of the Mound Builders (*q.v.*).



Courtesy Mayfield Photos, Inc., Dayton, Ohio

DAYTON, OHIO

Aerial view of the downtown section

Dayton's industries are diversified; chief among them are the manufacture of refrigerators, cash registers, accounting equipment, machine tools, automobile and aircraft equipment, and rubber products. Publishing is also important. The city

is the center of a standard metropolitan statistical area including Montgomery, Miami, and Greene counties (1,288 sq. m.; pop., 1960, 694,623). In 1958 it had a value added by manufacture of \$907,584,000; the city alone had a value added of \$744,856,000. The area is important agriculturally for production of grains, hogs, and dairy products. As the home of Orville and Wilbur Wright (*q.v.*), Dayton became the birthplace of aviation (*q.v.*). The Air Materiel Command maintains its headquarters at Wright-Patterson Air Force Base, 3 m. e. of the city.

Dayton has ca. 100 public and parochial elementary and secondary schools, enrolling ca. 70,000 pupils annually, in addition to business and technical schools. Institutions of higher learning include the Univ. of Dayton, Sinclair Coll., and United Theology Sem. Cultural facilities include Dayton Art Inst., with an art school, and the Museum of Natural History. Dayton is the site of the Veterans Admin. Center, a soldiers' home established in 1867. The city was among the first to adopt (1914) the city-manager form of government.

A town was laid out on the site of Dayton in 1795, and the first permanent settlers arrived from Cincinnati the following year. It was named for Capt. Jonathan Dayton, one of the original proprietors. Dayton was made a county seat in 1803, when Ohio became a state, and incorporated in 1805. It has suffered several serious floods, the worst one, in 1913, causing \$100,000,000 damage. The Miami Conservancy District, including five dams, was established to control the rivers and their tributaries.

From a population of 383 in 1810, the city developed rapidly to 85,333 in 1900. The decade of greatest growth was in the 1920's—152,559 in 1920 to 200,982 in 1930. In 1950 the population was 243,872; in 1960, 262,332.

Daytona Beach (*dā-tō'nā bēch*), a city in Volusia County, Florida, on the east coast of the state and on the west bank of the Halifax River. Located 92 m. s.s.e. of Jacksonville, Fla., it is served by the Florida East Coast Ry. Daytona Beach comprises several communities, including Holly Hill and Ormond Beach. The principal industry is fruit culture, but the city is primarily a summer and winter resort, with a beach (23 m. long) on which many auto-racing world records have been set. Bethune-Cookman Coll. is located here. The site was settled in 1870, and in 1926 most of the individual communities formed a single municipal government under the name of the city. Population, 1960, 37,395.

D-Day (*dē dā*), World War II term for June 6, 1944, the date when the British and American forces launched their amphibious invasion of the German-dominated continent of Europe. The related phrase, H-Hour, denoted the time of the

landings. The term arose through the use of D, meaning secret or undetermined day, and similarly H for undetermined hour, in official references. See *World War II*.

DDT (*dē-dē-tē*), dichloro-diphenyl-trichloroethane, an insecticide named from the initials of the chemical compound. It was first prepared by a Swiss chemist, Zeidler, in 1874; its use as an insecticide was first explored in 1940 by J. R. Geigy in Switzerland. As a pure chemical substance, it is manufactured under license from Geigy by several manufacturers in the U.S., who sell it to insecticide manufacturers for formulation in insecticides, either as dusting powders, wettable powders, in liquid solutions, in suspensions, in aerosol bombs, or in insecticidal paints. Most effective formulations contain from 5 to 10 per cent of DDT. Five per cent formulations are effective for flies, gnats, mosquitoes, bedbugs, and moths. Ten per cent formulations are preferred for fleas, lice, roaches, ants, carpet beetles, silverfish, and garden pests. DDT affects the nervous system of the insect, which is not killed immediately, but lives from five minutes to several hours before paralysis overtakes it, depending on the resistance of the insect species. DDT is poisonous to animals, birds, fish, and man when swallowed, inhaled, or absorbed in oil solutions. Oil solutions are for spraying or treating surfaces where insects alight or collect, and the residue left by these oil solutions will continue to kill insects which alight on it for days after it has been applied. Oil solutions should never be used on animals. No form of DDT should be applied to animals which lick their fur, such as cats and dogs. See also *Insecticide*.

Deacon (*dē-k'n*), in the Roman Catholic Church and the Church of England, a church officer subordinate to the priest. His principal duties include collection and distribution of alms and taking care of the poor and the sick. In the Roman Catholic Church, he originally assisted in the administration of the Holy Communion. In the Anglican and Episcopalian churches, he still performs this function, also administering baptism. The office was instituted in the earliest days of Christianity.

Deaconess (*dē-k'n-ēs*), name of an order maintained among the women in the Christian churches. An order of deaconesses is mentioned in the New Testament, in 1 Tim. 5:9-10 and Rom. 16:1. It appears that this order was established in Apostolic times, when the deaconesses assisted in the work among members of their own sex and to some extent supplemented that of the deacons. In the early centuries it was connected with the Roman Catholic Church, but was abolished in the 12th century. Theodor Fliedner, a pastor of the United Evangelical Church of Germany, in 1836 founded a home for deaconesses, in which

the duty of the inmates was to do charitable work. Since then many similar homes have been established in Germany and other parts of Europe, such as the various sisterhoods in the Anglican Church of England.

Among the first orders of deaconesses established in America was that of St. Andrew's Parish, Baltimore, Md., under the auspices of the Protestant Episcopal Church in 1855. The order is recognized by the Lutheran Church in America, which erected the Drexel Home for Deaconesses at Philadelphia, Pa., in 1888. In the same year the order was established by the general conference of the Methodist Episcopal Church. It is sanctioned by the Presbyterian and other Protestant churches, and many homes are maintained both in Canada and the U.S. The work of the deaconesses in the different churches is quite similar. As a whole the order may be said to constitute an independent society of charitable women, including many trained nurses, who do good work in relieving suffering and in spreading Christianity.

Dead Letter (*dēd lēt'ēr*), a letter that lies at a post office unclaimed for a certain period, or one so defective in address that it cannot be delivered. The U.S. Post Office Dept. maintains dead-letter offices where all unclaimed letters are sent, including those that do not show addresses. These letters are opened at the dead-letter office, and, if the address of the writer is found, they are returned to the sender; otherwise, they are destroyed. According to the most recent statistics, over 18,000,000 letters reach the dead-letter office annually. Of these about 17 per cent are returned. Money and checks found in letters are returned to the senders if their names and addresses are known, while periodicals, magazines, and picture cards are sent to various hospitals and libraries. Parcels that cannot be returned are sold at periodic auctions.

Dead-Nettle (*dēd-nēt'l*), a weed, very common in Great Britain, also found in the U.S. It is closely related to hemp-nettle, and when touched causes skin irritations.

Dead Sea (*dēd sē*), a famous lake located in the center of the eastern border of Palestine. It is bordered on the E. by the Hashemite Jordan Kingdom (Trans-Jordan), on the S.W. by Israel, and on the N.W. by Arab Palestine. It is located about 20 m. S.E. of Jerusalem and 10 m. S. of Jericho. It stretches north and south a distance of ca. 45 m., and has a width of ca. 10 m. It receives the waters of the Jordan and many other rivers. It is 1,286 ft. below the level of the Mediterranean. It is bordered by lofty cliffs of limestone along its eastern and western shores, while its northern and southern extremities are marked by low and dismal marshes. Violent earthquakes that occurred in periods far remote are evidenced by lava and volcanic deposits.

Thermal and sulfur springs, pumice stone, rock salt, and other such features abound. In the Scriptures it is called the Sea of the Plains, Salt Sea, and East Sea, and is thought to be the site of the ancient Sodom and Gomorrah.

The water of the Dead Sea is remarkable for the quantity of its saline ingredients. In every 100 pounds of its water there are over 26 pounds of saline substances, or more than one-fourth. It is nauseous to the taste and smell, and so buoyant that the human body floats upon its surface. The maximum depth in the central portions is 1,315 ft., while the southern lagoon is 12 ft. deep in the middle, and at the edges not more than 3 ft. Geologists have advanced the theory that the inflowing waters carry sufficient saline matter to transform the lake into solid saline deposits, within a considerable period of time, unless present conditions become greatly modified by climatic or volcanic changes. The saline density increases as the arid atmosphere carries off inflowing moisture by means of evaporation.

Dead Weight (*dēd wāt*), 1) a portion of the national debt of Great Britain consisting of such items as do not represent investments or reproductive outlay, including the permanent debts to the Bank of England. 2) in shipping, the term applied to charging by weight of the freight instead of the bulk.

Deadwood (*dēd' wōōd*), county seat of Lawrence County, South Dakota, in the Black Hills, on the Chicago & North Western and the Chicago, Burlington & Quincy R.R.'s. It is surrounded by a mining region which produces gold, silver, tin, lead, and clays. Mining, lumbering, and ranching are the principal industries. Deadwood was settled in 1876 as a pioneer town. Mount Moriah Cemetery, on a high mountain overlooking the town, contains the graves of Wild Bill Hickok and Calamity Jane. Population, 1950, 3,288.

Deaf (*dēf*), THE, persons born without usable hearing, or who lost it at some point in life. A person with a partial hearing impairment is designated as "hard of hearing." Because it is rather awkward to adhere to this latter term it is usual to extend the use of the word deaf to those whose impairment is not complete and to use terms such as "partially deaf." Those who have lost their hearing before speech was acquired in the natural way, that is, through imitation, were known formerly as deaf mutes. Before speech teaching for them came into practice, many remained mutes throughout their lives, and some still do, but through highly specialized training, begun when they are very young, deaf children may be taught to speak and to use the language.

Speech is acquired through training of the senses of sight and touch, and through the use of any residual hearing. Language is acquired

through lip reading, reading and writing, and sometimes by the aid of finger spelling. Lip reading is understanding a speaker by watching the movements of the mouth.

The language disability of a deaf child is a serious handicap, but once a command of language is acquired his progress depends on his natural aptitudes and training. The average school for the deaf takes its pupils only to the high school grades, and many students receive no further education. A few attend Gallaudet Coll., Washington, D.C., the one college for the deaf in the U.S., and a few others graduate from high school and colleges for those with normal hearing.

The speech of the deaf never sounds just like the speech of persons who hear normally, but it is often readily intelligible. Deaf persons who speak and read the lips are able to carry on a normal business and social life.

It has been learned that many so-called deaf children have enough residual hearing to enable them to use hearing aids in the acquisition of speech and language. Even children as young as two or three years old are being taught by means of group earphones in nursery classes, and sometimes by individual instruments. The increased ruggedness and decreased size of present-day hearing aids have made this possible.

The causes of hearing impairments are many: some of them are mechanical, and some are related to the nerve connections from the ear to the brain. Wax or foreign bodies in the ear canal may reduce the sound reaching the ear drum. The middle ear mechanism—with the ear drum, three small bones, and two inner windows—may be interfered with by enlarged or diseased tonsils and adenoids, excess lymphoid tissue, frequent colds, catarrh, neglected running ears or other infections in the middle ear, blows on the external ear, water in the ears from swimming and diving (especially if the ear drum has been punctured), or a bony growth in certain locations in the middle ear. The inner ear and nerve connections may be adversely affected by infected teeth, measles, mumps, scarlet fever, meningitis, quinine taken by the mother during pregnancy or labor, and German measles contracted by the mother during the early months of pregnancy. Heredity may be a factor in the functioning of any part of the ear mechanism.

The impairment due to interfering bony growth in the middle ear referred to above is known as otosclerosis. The normal motion of the oval window between the air cavity of the middle ear and the fluid cavity of the inner ear, is impeded by this bony growth. In certain selected cases, it is possible to perform a surgical operation to give an added window connection between the middle and inner ears, and a percentage of these operations result in the restoration of hearing to a

useful social level. This surgical procedure is known as the "fenestration operation."

The percentage of deafness has often been estimated but never accurately ascertained. On the basis of the numbers that have been educated in special schools, it may be roughly stated that there are in the U.S. 100,000 persons deaf enough from childhood to need special education. At present there are *ca.* 25,000 enrolled in classes for the deaf. In addition to some denominational and private schools, there are many public schools, both residential and day, maintained by state or municipal funds, or by both. Gallaudet Coll. at Washington, D.C., the only college exclusively for the deaf, is supported by Federal grants.

Methods of instruction vary in these schools. Some teach only by speech and lip reading, while others also permit finger spelling and signs to convey ideas. Both educators and the deaf themselves differ as to the best methods. Obviously, the sign-using deaf are restricted socially.

Because of the scarcity of workers during World War II the deaf who had been adequately trained in special skills found no difficulty in obtaining employment. Their records for output, dependability, and steadiness on the job were good—often better than for persons with normal hearing. The skills and talents of the deaf are varied. The majority become artisans and skilled laborers, but there are also unskilled laborers, as well as architects, artists, research workers and even professional dancers. (It is through cultivation of the sense of rhythm that the deaf are able to dance in time to music.)

The present trend in the education of the deaf is toward the establishment of pre-school classes, either in residential or day schools. In some states, special institutes are conducted for parents of young deaf children, so that the proper kind of home training may be begun early and the formative years utilized to the best advantage. Demonstration classes with children are usually held in conjunction with these courses. Many mothers are also receiving guidance through the John Tracy Clinic in Los Angeles, Cal.

Recent studies indicate that there exists a "psychology of deafness" among persons whose hearing is impaired. The psychological effects depend on the personality involved and so are neither universal nor uniform. Suspicion toward and uneasiness among strangers are the most frequent reactions of the deaf.

The following organizations in the U.S. are engaged in promoting the education of the deaf: the Convention of American Instructors of the Deaf, the Conference of Executives of American Schools for the Deaf, and the American Association to Promote the Teaching of Speech to the Deaf. The last-named organization, located in Washington, D.C., was founded by Alexander Graham Bell,

who also founded and endowed the Volta Bureau, Washington, D.C., a national and international information center dealing with problems of deafness. The Volta Bureau is now the headquarters of the American Assn. to Promote the Teaching of Speech to the Deaf. It has a large special library dealing with deafness and related subjects—probably the largest of its kind. See also *Hearing Aids*.

Deák (*dă'āk*), FERENCZ, lawyer and statesman, born at Sötör, Hungary, Oct. 17, 1803; died at Budapest, Jan. 29, 1876. He studied law and, in 1833, was elected to the Hungarian Diet, where he became a leader of the liberals. In the struggle with Austria for Hungarian constitutional rights he urged moderation and the avoidance of bloodshed and opposed the radical policies of Kossuth (*q.v.*). Deák was chosen minister of justice in the national cabinet in 1898 after the Hungarian revolution. He resigned his portfolio when Kossuth came into power on Sept. 17, 1848, living in retirement until 1860, when he became leader of a moderate party. He was instrumental in forming the union of Austria and Hungary in the dual form of government, under which the Emperor of Austria was also the King of Hungary, and the people of the latter country were granted equal liberties and constitutional rights with those of Austria.

Deakin (*dē'k'n*), ALFRED, statesman, born at Melbourne, Australia, Aug. 3, 1856; died Oct. 8, 1919. He was educated at Melbourne Univ. and entered the Parliament of Victoria in 1878. Later he held a number of public offices, such as solicitor general (1885) and minister of public works (1883-86). In 1901 he was made the first attorney general of the Commonwealth of Australia, serving until 1903, when he became prime minister, but was succeeded by Watson the following year. He was again prime minister (1905-08) and (1909-10) and worked in cooperation with Great Britain for Australian defense. His publications include "Irrigation in Egypt and Italy," Temple and Tomb," and "Irrigation in Western America."

De Amicis (*dā ä-mē'chēs*), EDMONDO, soldier and author, born in Oneglia, Italy, Oct. 21, 1846; died in Bordighera, Italy, March 11, 1908. He attended military school and served in the Italian army for some five years. Encouraged by the success of his first book of short stories, "*La vita militare*" (1868; "Military Life in Italy," 1882), he retired from the army. In addition to well-known travel books and "Cuore" (1886; "An Italian Schoolboy's Journal," 1887), he wrote on the Italian language and on educational and social problems. He is sometimes criticized for sentimentality and a tendency to moralize.

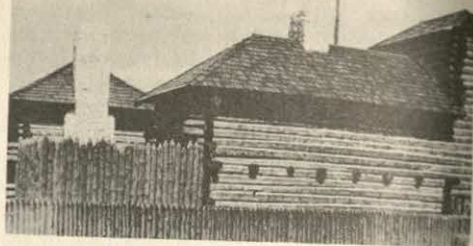
Dean (*dēn*), VERA MICHELES, research director, author, and lecturer, born at Petrograd, Russia, Mar. 29, 1903. Coming to the U.S. in 1919, she studied first at Radcliffe Coll. and then at Yale

Univ., from which she received her Ph.D. in 1928. Three years later she became research associate and editor of research publications for the Foreign Policy Assn., and in 1938 was made research director and editor. She is the author of a number of books on international affairs, among them "Europe and the United States" (1950), "Foreign Policy Without Fear" (1953), "New Patterns of Democracy in India" (1959), and "Builders of Emerging Nations" (1961).

Deane (*dēn*), *SILAS*, diplomat, born at Groton, Conn., Dec. 24, 1737; died at Deal, England, Sept. 23, 1789. He graduated from Yale Coll. in 1758, served as delegate from his state in the Continental Congress of 1774-76, and in the latter year he was sent by Congress to France on a mission to secure financial aid. Later he was joined by Benjamin Franklin and Arthur Lee and succeeded in obtaining the assistance of Lafayette, De Kalb, and others for the American cause. His failure to keep accurate accounts and his dispute with Lee over contracts led to his recall by Congress in 1777. He later returned to France to secure proof that he was not dishonest. Subsequently he retired to England where he wrote pessimistic letters about the struggle for American independence. These letters increased the animosity of his countrymen. However, a Congressional investigation made in 1842 showed that his country had wronged him through the charges of political enemies. The government of the U.S. paid \$37,000 to his heirs. Among his writings regarding the question of faithful service he published "Address to the Free and Independent Citizens of the United States of North America."

Dearborn (*dēr'börn*), a city in southwestern Michigan, in Wayne County, 6 m. w. of Detroit. It is served by the New York Central, the Pennsylvania, and other railroads. The city is famous as the home of the Ford automobile industry. In 1958, Dearborn (a part of the Detroit, Mich., standard metropolitan statistical area) had a value added by manufacture of \$459,146,000. Among Dearborn's principal buildings are the Henry Ford School of Vocational Guidance, and Greenfield Village, a collection of structures that show the profile of America from the time of the Pilgrims to the present. Dearborn was incorporated as a city in 1927. Population, 1950, 99,994; in 1960, 112,007.

Dearborn, FORT, a fort built in 1803 at the mouth of the Chicago River, near lake Michigan, on the site of Chicago. The purpose was to form a defense against the Indians. When war was declared against England in 1812, Gen. Hull, the commander, ordered its abandonment and the withdrawal of the garrison to Detroit as a safety measure. The Indians attacked the retreating Americans, and two-thirds were massacred, in-



RECONSTRUCTION OF FORT DEARBORN

cluding 12 children. The remainder surrendered on promise of safety and were permitted to return to their homes, after being taken to Ft. Mackinaw. The fort was rebuilt in 1816 and garrisoned till 1837. The last building was destroyed in the Chicago fire of 1871.

Dearborn, HENRY, soldier and statesman, born at Hampton, N.H., Feb. 23, 1751; died June 6, 1829. He practiced medicine until 1775 when he joined in the struggle for American independence. He gathered 60 minutemen and the day following the Battle of Lexington marched to Cambridge and served as captain at the Battle of Bunker Hill. He was with Arnold's expedition at Quebec and later fought at Monmouth, Yorktown, and Saratoga, attaining the rank of major. He served as Secretary of War under President Jefferson (1801-1809). At the beginning of the War of 1812 he was advanced to major general, was made commander of the northern department, and captured York (now Toronto) in 1813. He resigned his commission in 1815 and later served as minister to Portugal (1822-24).

Death (*dēth*), the extinction of life in animals and plants, resulting from a cessation of the vital functions. It sometimes occurs from natural decay, as in old age, but more commonly from disease or accident. The two forms consist of death of the whole body, and death of a portion, or the *somatic* and the *interstitial*. There are three principal modes of dying—those that begin at the lungs, heart, and brain—and they are respectively designated as suffocation, syncope, and coma. Death by *suffocation* begins at the lungs. In this form the functions of respiration are suspended, after which the heart ceases beating in about three minutes, though the pulse may be felt for some time after all other signs of life have vanished. When the action of the heart ceases from loss of blood, death results by *syncope*, or *fainting*. Death may likewise take place in this form by a decline of the aortic pressure of the heart, by a loss of nerve power, and by starvation. Death by *coma* begins at the brain. It is indicated by profound stupor and the breathing is accompanied by snoring. Death ensues when all vitality and power of action have become extinct.

The death rate per 1,000 of population, in 1955,

in the U.S. was 9.3, as against a birth rate of 24.6, the highest birth rate in the last 30 years.

Death's-Head Moth (*dēthz-hēd math*), a species of European hawk moth, of dark color with markings on the thorax that resemble a human skull. The length from tip to tip of its extended wings is 5 in. Its large caterpillar feeds on tomato and potato plants.

Death Valley (*dēth vāl'ly*), a sandy plain in Inyo County, California, near the border of Nevada. It is about 150 m. long and 35 m. wide, and some 280 ft. below sea level. On the west it is bordered by the Panamint Mts., which shut out the Pacific winds, and on the east by the Amargosa Desert. Aside from the cacti and sagebrush, it is almost destitute of vegetation. The region was formerly heavily mined for borax. See also *Monuments*.

Deborah (*dēb'ô-rā*), a prophetess who lived about 1316 B.C., and is regarded as mother of Israel. Her patriotism led to the delivery of the Hebrews from the oppression of the Canaanites, under which they had suffered 20 years. The Song of Deborah is recorded in Judges 5, and is one of exultation over the deliverance of the nation. The Old Testament contains no poetry of greater beauty, and this song is thought to constitute the oldest specimen of Hebrew literature.

Debrecen (*dē'brē-tsēn*), a city of Hungary, capital of the county of Hajdú, 137 m. E. of Budapest. It is famous as the seat of a Protestant college, founded in 1531, which has a library of 100,000 volumes. Debrecen became a Protestant town in the 16th century. It played a part in the revolution of 1848-49 and in World War II. Population, 1941, 125,933.

Debs (*dēbz*), EUGENE VICTOR, labor leader, born at Terre Haute, Ind., Nov. 5, 1855; died Oct. 20, 1926. He studied in the public schools and worked as a railroad fireman (1870-74) and as a grocery clerk (1874-79). He was chosen national secretary and treasurer of the Brotherhood of Locomotive Firemen in 1880 and in 1885 was a member of the Indiana state legislature. In 1893 he organized the American Railway Union which supported the workmen of the Pullman Palace Car Co. in the famous strike for higher wages (1894). In the great railroad strike which followed, President Cleveland ordered Federal troops to Chicago to enforce the decrees of the U.S. court as to the mail service and interstate commerce. Later Debs and several others were indicted and imprisoned six months. The political term, "government by injunction," originated largely from the troubles in Chicago. He was sentenced to imprisonment for 10 years, in 1918, for a speech which was held to violate the Espionage Act of 1917, but he was pardoned in 1921 by Pres. Harding. In 1900, 1904, 1908, 1912, and 1920 he was the Socialist candidate for President.

Debt (*dēt*), an obligation, liability, or claim incurred. The one owing a debt is the *debtor*; the one to whom it is owed is the *creditor*. Debts may be personal, corporate, municipal, county, state, provincial, or national. Although in law the term debt refers to a sum of money due upon a fixed contract, in the general sense it may mean money, goods, or services owed by one person to another. It is a well-known characteristic of many individuals and of governments to draw financial aid from the prospects of future development in commercial enterprises. National debt refers to a government's outstanding obligations, as, for example, loans. The total national indebtedness of the U.S. has been increasing constantly, and internal and intergovernmental debts have soared tremendously due to the World Wars, depression and unemployment relief, etc. At the beginning of the Civil War (1861), the principal of the public debt in the U.S. was only \$64,842,288, while the net receipts amounted to \$55,000,000 per annum.

The figures for the U.S. national debt from 1880 to the present reveal the increase, especially in war and postwar years: 1880, \$2,090,908,872; 1900, \$1,263,416,913; 1920, \$24,299,321,467; 1940, \$42,967,531,038. In May 1944, Congress put a ceiling of \$240,000,000,000 on the national debt. It was increased in 1945 to \$300,000,000,000, but the Debt Act of 1946 set a permanent limit of \$275,000,000,000. Since then the legal limit has been adjusted as follows: August 1954, \$281,000,000,000; July 1956, \$278,000,000,000; and February 1958, \$280,000,000,000. The actual debt during those years was: \$269,422,099,173 in 1946; \$271,259,599,108 in 1954; \$272,750,813,649 in 1956; \$270,527,171,896 in 1957; and \$274,951,036,263 in May 1958.

Debt of Honor, a sum of money one person has pledged to pay to another in betting or gambling, and which he is obligated to pay as a matter of honor, although the sum is unrecoverable by court action.

Debussy (*dē-bü-sē'*), CLAUDE (originally Achille-Claude), composer, born at St-Germain-en-Laye, France, Aug. 22, 1862; died Mar. 25, 1918. At 11, he began his musical studies at the Paris Conservatory and at 22 his cantata "L'Enfant Prodigue" won the Grand Prix de Rome. At first considered too unacademic, his musical compositions eventually gained recognition and today are highly esteemed. The individual style and suggestive beauty of his music are clearly evident in his symphonic poem, "L'Après-midi d'un Faune" (1902); his only opera, "Pelléas et Mélisande" (1902), and the piano composition, "Clair de Lune" (1890) from "La Suite Bergamasque" (1890-1905). See illustration on the following page.

Debye (*dē-bī'*), PETER JOSEPH WILLIAM, chem-



CLAUDE DEBUSSY

Courtesy Brown Bros., N. Y.

ist and physicist, born at Maastricht, Holland, Mar. 24, 1884. He worked as an engineer after graduating from the Engineering School at Aachen in 1905, five years later became an assistant in theoretical physics at the Univ. of Munich and, in 1911, professor of theoretical physics at the Univ. of Zurich. He returned to his own country (1912) as professor of theoretical physics at the Univ. of Utrecht, a position he resigned after two years. He also taught at Göttingen, Berlin, and Leipzig, and later (1935) became director of the Kaiser Wilhelm Inst. for Physics, Berlin. In 1936 Debye was awarded a Nobel Prize for his contributions to the knowledge of molecular structure through investigations on dipole moments and on the diffraction of X-rays and electrons in gases. He was appointed professor of chemistry and department chairman at Cornell Univ. in 1940 when he came to the U.S.

Decabrists, OF DECEMBRISTS (*děk'ă-brists*, *dě-sēm-*), a term applied to those Russian mutineers who staged an unsuccessful uprising among liberally minded imperial troops at St. Petersburg and Podolia in December 1825, in the interim between the death of Czar Alexander I and the succession to the throne of Nicholas I.

Decadence (*dě-kă'dens*), a term characterizing a period of decay in civilization. The years 200 till 400 A.D. are generally called the decadence or decline of the Roman Empire, as the 17th century, the Baroque century, is called the decadence of the Renaissance.

Modern scholarship is rather reticent in using this term, since experience has proved that even though certain values of earlier periods are lost in ages of decadence, new esthetic values appear, which on their part characterize the period of so-called decadence. Thus the term can be used only in relation to a previous epoch, but not as an absolute classification or evaluation.

DECATUR

Decalogue (*děk'ă-lóg*), the Ten Commandments given to Moses on Mt. Sinai. They are placed in the Bible before the collection of laws called the Book of the Covenant, but are also found in Deut. 5:1-21. Christ summed them up in two commandments.

Decamps (*dě-kăn'*), ALEXANDRE GABRIEL, painter, born at Paris, France, Mar. 3, 1803; died Aug. 22, 1860. He received training under Abel de Pujol and other noted masters. He traveled extensively in the East, studying Oriental life, and afterward produced many of the scenes with bold fidelity. His paintings are notable for depth and richness of tone. Among his most important works are "Turkish Children Going Out of School" and "Defeat of the Cimbri."

De Candolle (*dě-kăn-dôl'*), AUGUSTIN PYRAME, botanist, born at Geneva, Switzerland, Feb. 4, 1778; died there, Sept. 9, 1841. He studied at Geneva and Paris and his two earliest publications, "*Historia plantarum succulentarum*" (1799) and "*Astragalogia*" (1802), attracted the attention of Lamarck (*q.v.*), who commissioned him to write "*Flore française*." In this study, which took over 12 years to complete, De Candolle explained the natural system of plant classification which he had devised. At the request of the French government he made a study of the flora of France (1806-12). He was professor of natural science at Geneva (1816-34).

His son, ALPHONSE LOUIS PIERRE PYRAME DE CANDOLLE (1806-93) succeeded him as professor of natural science at Geneva and director of the botanical garden there. Alphonse de Candolle, in collaboration with his son, Anne Casimir Pyrame de Candolle (1836-1925) continued the writing of "*Prodromus systematis regni vegetabilis*" which Augustin de Candolle had started.

Decapolis (*dě-kăp'ô-lis*), a word meaning 10 crustaceans. The members of this order have five pairs of legs, the first pair being enlarged to form claws, as in the crawfish, lobster, shrimp, and prawn. The term is also applied to one of the classes of cuttlefish. They have eight arms and two tentacles. The tentacles, longer than the arms, serve to seize their prey, or to moor themselves safely in a stormy sea.

Decapolis (*dě-kăp'ô-lis*), a word meaning 10 cities, applied to a district of eastern Palestine prior to the 2nd century A.D. The 10 cities included in the district comprised Canatha, Damascus, Dion, Gadara, Garasa, Hippos, Pella, Philadelphia, Raphana, and Scythopolis. It is probable that these cities were built by the Romans in 64 B.C. after the conquest of Syria, and received grants of certain commercial privileges.

Decatur (*dě-kă'tēr*), county seat of Morgan County, Ala., on the Tennessee River, 90 m. N. of Birmingham. Founded in 1820 by order of President Monroe, and named for Stephen Deca-

tur (*q.v.*), it is a manufacturing town, producing cotton cloth, hosiery, iron and steel products, copper tubing, and other products. Population, 1940, 16,604; in 1950, 19,974.

Decatur, county seat of De Kalb County, Georgia, a residential town 6 m. N.E. of Atlanta. Population, 1940, 16,561; in 1950, 21,635.

Decatur, county seat of Macon County, Ill., 37 m. E. of Springfield, on the Illinois Central, the Wabash, and other railroads, and on the Sangamon River. It is the seat of James Millikin Univ. Places of interest include the Decatur Art Center, the Millikin Conservatory of Music, and the Lincoln log courthouse. The manufactures include corn and soybean products, metals, plastics, and pharmaceutical supplies. The surrounding country is agricultural, and Decatur is the center of the U.S. cotton wash-dress industry. It was settled in 1830 and incorporated in 1836. Population, 1940, 59,305; in 1950, 66,269.

Decatur, STEPHEN, naval officer, born at Sinnenpuxent, Md., Jan. 5, 1779; died Mar. 22, 1820. He was the son of Stephen Decatur (1751-1808), an American naval officer. His first naval experiences were on board his father's ships; he became a midshipman at 19. He served on the *United States* during the French war (1798) and was commissioned lieutenant the following year. In command of the *Enterprise*, he took an active part against Tripoli in 1801-05, in the Mediterranean, and played a conspicuous part in destroying the *Philadelphia* when it was captured by the enemy. He promptly entered the harbor of Tripoli, boarded the *Philadelphia*, and, after setting the ship on fire, escaped to his own vessel under a rain of shot. For this he was promoted to the rank of captain in 1804. When the War of 1812 commenced, he was placed in command of the warship *United States* and captured the British frigate *Macedonia*. In 1813 his flagship, the *President*, was forced to surrender to the British in New York harbor. In 1815 he proceeded to Algeria to punish the Dey (governor) for interfering with American merchantmen, and required that country and Tunis to pay damages for violating their treaties with the U.S. In 1820 he became involved in a duel with Com. James Barron and was mortally wounded.

Decan (*dēk'an*), the name applied to a large scope of country in eastern India, particularly to the portion lying between the Kistna and Nerbudda Rivers, but also in a general way to the whole country lying south of the Vindhya Mts. When applied in the latter sense, it includes the Madras presidency, Mysore, Hyderabad, part of Bombay, Travancore, and other dependent states of India.

December (*dē-sēm'bēr*). See *Month*.

Decembrists (*dē-sēm'brists*). See *Decabrist*.

Decemviri (*dē-sēm'vī-rī*), the term applied

to the 10 men appointed to codify the public laws of Rome. With this end in view, a number of commissioners proceeded to Greece to study the laws of Solon and other celebrated Greek legislators. On their return in 451 B.C., 10 patricians secured an appointment to write the laws under the leadership of Appius Claudius. The laws were set on 12 tables of wood in the Forum, and became known as the Laws of the Twelve Tables. This action on the part of Rome was due to the dissatisfaction of the plebeians, because the patricians had no written law to direct them.



Courtesy U. S. Navy Dept.

STEPHEN DECATUR

Decentralization (*dē-sēn-tral-ī-zā'shūn*), as opposed to centralization in government policy, the strengthening in importance and power of the lesser government units. In the U.S., the tendency towards decentralization is perpetuated in the jealously guarded states' rights.

Decimal Point (*dēs'i-mal*), the period separating the integral portion of a number from the decimal fraction. It originated with John Napier, a mathematician of the 17th century. The decimal point in the number 82.4 indicates that the number consists of 82 integers and the fraction $\frac{4}{10}$. The decimal point determines that power of 10 which is the denominator of the decimal fraction.

Decimal System, a method of counting by whole numbers that makes use of 10 as a base and hence is called a decimal system. Fractions are also expressed in this system as *decimal fractions*, in which the denominator is a power of 10 whose value is indicated by a point placed between or before digits in the numerator, zeros being prefixed if necessary. For example, $\frac{1}{10}$ is written .1; $\frac{1}{100}$ as .01; $\frac{1}{1000}$ as .001, and so on. To express an ordinary fraction as a decimal fraction we merely carry out the division indicated by the fraction.

Decius (*dē'shī-ūs*), GAIUS MESSIUS QUINTUS

TRAJANUS, Emperor of Rome, born in Pannonia in 201; died in 251. He commanded the troops of Emperor Philip on the Danube. His soldiers revolted in Moesia and compelled him, under threat of death, to proclaim himself emperor. Philip marched against him and was slain in battle near Verona. Decius, in his short reign of two years (249-251), persecuted the Christians. He martyred Cyprian, Bishop of Carthage, and Fabianus, Bishop of Rome, and imprisoned Origen. In 251 he conducted an expedition against the Goths, who had crossed the Danube, but he and his son fell in battle near Arbritum.

Decker (*děk-ēr*), or DEKKER, THOMAS, dramatist, born in London about 1570; died after 1637. Little is known of the man, save that he lived from hand to mouth, often being imprisoned for debt. He collaborated with Michael Drayton, Ben Jonson, and others, and in addition wrote a number of plays and pamphlets, some of which are lost. His extant works include "Seven Deadly Sinnes of London," a moral tract; "The Gull's Hornbook," a satire on manners; "The Honest Whore," a domestic drama; and a realistic play on London life, "The Shoemakers' Holiday."

Declaration (*děk-lā-rā-shūn*), the act of declaring, or making known, or publishing an avowal or affirmation. The most important declaration is the one issued by the American colonies (*q.v.*). A declaration of war is a formal notice that, by the practice of nations, belligerents are expected to give before hostilities begin. The *Declaration of Rights* is a document which was drawn by the British Parliament in 1689 and presented to William III, and Mary, when they accepted the crown of England. In this document Parliament announced that the election of members of Parliament shall be free, that Englishmen have the right to carry arms for their own defense, that unusual punishments and excessive fines shall not be inflicted, that public revenues shall not be collected without the consent of Parliament, and that a standing army shall not be raised or maintained in times of peace. Subsequently the *Bill of Rights*, a formal enactment, contained these articles. The *Declaration of Paris* is an instrument signed by the Congress of Paris in 1856, which was subsequently accepted by the principal powers. Among the declarations it contained these: Neutral goods, except contraband of war, are not liable to capture under an enemy's flag; privateering should be abolished; the goods of an enemy, except contraband of war, may be covered by a neutral flag; and blockades must be effective in order to be binding.

Declaration of Independence. See *United States, Declaration of Independence*.

Declaratory Act (*dě-klār-ā-tō-rj*), an act passed by the British Parliament, in 1766, claiming for King and Parliament power to make laws

and statutes of sufficient validity to bind the colonies in all cases whatsoever. It nullified in the American Colonies the effect of the previous repeal of the Stamp Act. (*q.v.*)

Declination (*děk-lī-nā-shūn*), in astronomy, the angle between the direction of a heavenly body and the celestial equator. It corresponds to the latitude on the earth's surface. It is counted positively north of the equator and negatively below the equator, which divides the sky into a northern and a southern hemisphere. *Magnetic declination* (also called *variation*) is the angle which the magnetic needle in a given place makes with the north-south line. It can be either east or west of the north point and for any locality slowly changes in the course of time.

Decline and Fall of the Roman Empire (*dě-klīn and fāl of the rō'man ěm'pīr*), THE, a monumental historical work, written (1776-88) by the English historian, Edward Gibbon (*q.v.*).

Decomposition (*dě-kōm-pō-zīsh'ūn*), in chemistry, the separation of a compound into more simple substances. When the red oxide of mercury is heated, it undergoes decomposition and is resolved into mercury and oxygen. Water, when subjected to electricity (the process is called electrolysis, *q.v.*), is decomposed into hydrogen and oxygen. Decomposition in vegetable and animal matter is due to minute animals or plants, known as *bacteria* and *ferments*. Many decompositions are effected by light, as those of nitric acid and of the silver salts used in photography.

Decorated Style (*děk'ō-rāt-ēd stīl*), in art, the second of three periods in English Gothic architecture, between about 1280 and 1380. It is characterized by rich decoration of the vaults and the traceries of the windows.

Decoration (*děk-ō-rā-shūn*), the deliberate beautification of necessary, functional parts of utensils, vessels, and interior and exterior parts of buildings.

INTERIOR DECORATION is the general term for all the processes, materials, and furnishings essential to make interior spaces (rooms, hallways, etc.) pleasing to the eye as well as appropriate for the use to be made of the spaces—*e.g.*, home, business office, or church.

Home decoration is one of the oldest of all arts. Primitive cave drawings and carvings may be considered perhaps its earliest manifestations. Through the ages, each type of civilization has developed its own distinctive forms and standards for decoration, always evolved from the life, interests, and needs of the people. Ancient cultures—*e.g.*, those of China, Egypt, Greece, Rome—have furnished later designers with a wealth of materials, motifs, and special skills; but interior decoration as we know it really began only with the Renaissance (*q.v.*). The 300 years which followed (1500-1800) saw the development of home

decorating in Europe, from medieval attempts to achieve comfort-plus-beauty through Gothic and Romanesque patterns to the exquisite refinement of decorating skills which created the artistic masterpieces of design and workmanship typical of 18th-century England, France, and America.

By *periods* in decorating we usually mean the series of traditional furniture and decorative styles during the 300 years following the Renaissance, each with its own distinctive characteristics and closely related to its historical background. The major periods in decorative development—specifically those which have had the greatest influence on home decorating in the U.S.—are outlined below. Details of individual periods will be found elsewhere, under their names alphabetically listed (as *Chippendale*, *Louis XV*, etc.). See also *Furniture*.

MAJOR HISTORICAL PERIODS IN DECORATING From Renaissance to Modern

ENGLISH

"AGE OF OAK," 1500-1700: TUDOR AND ELIZABETHAN PERIODS, 1485-1603; developed under Henry VII, Henry VIII, and Queen Elizabeth. JACOBAN PERIOD, 1603-89; developed under James I and Charles I, and including RESTORATION under Charles II and James II.

"AGE OF WALNUT," 1689-1714: WILLIAM AND MARY PERIOD, 1689-1702; developed under William of Orange (William III) and his queen, Mary Stuart. QUEEN ANNE PERIOD, 1702-14; developed under Queen Anne.

"AGE OF MAHOGANY," 1714-1810: EARLY GEORGIAN PERIOD, 1714-35; developed under George I. GEORGIAN PERIOD ("Golden Age"), 1735-1810; developed under George II and George III, and including styles named after four great designers of the period: (1) CHIPPENDALE (Thomas), active period 1735-79; (2) HEPPLEWHITE (George), active period 1760-86; (3) ADAM (Robert), active period 1762-92; (4) SHERATON (Thomas), active period 1790-1806.

"AGE OF SATINWOOD," 1810-20: ENGLISH REGENCY PERIOD, 1810-20; developed under last years of George III.

"AGE OF VICTORIA," 1837-1900: developed under Queen Victoria, and often called, usually in derogation, "Machine Age."

FRENCH

BOURBON PERIODS, 1643-1800: LOUIS XIV PERIOD, 1643-1723; first great Bourbon style, including FRENCH REGENCY. LOUIS XV PERIOD, 1723-74; finest Bourbon style, and "Golden Age" of French design. LOUIS XVI PERIOD, 1774-89; last of pure Bourbon styles, with transition features. FRENCH PROVINCIAL STYLES, 1700-1800; modifications of later Bourbon styles (dates approximate).

POST-BOURBON PERIODS, 1789-1814 (revolt against Bourbon): DIRECTOIRE PERIOD, 1789-1804; developed during French Revolution and under Napoleon's Consulate. EMPIRE PERIOD, 1804-14; developed under Napoleon's Empire.

AMERICAN

EARLY AMERICAN PERIOD, 1608-1720 (also called COLONIAL); influenced by earlier and parallel English periods—Tudor, Jacobean, William and Mary, Queen Anne.

AMERICAN GEORGIAN PERIOD, 1720-80 (also loosely called COLONIAL); dominated by English Georgian styles.

FEDERAL PERIOD, 1780-1830; influenced by Late Georgian, English Regency, Directoire, Empire, as well as by the American Duncan Phyfe (*q.v.*). During this period design motifs such as eagles, arrows, and stars reflected the growth of American nationalism.

AMERICAN VICTORIAN PERIOD, 1837-1900; dominated by English Victorian style.

"Modern" styles of the 20th century followed the Victorian Age in England, Western Europe, and the U.S. Though it began merely as a revolt against the discomfort and overelaboration of Victorian decoration, this most recent development has now long been established on its own merits. It still retains the basic principles employed by its originators: functionalism, close relationship between home surroundings and the needs of family life, utilization of beauty inherent in materials rather than addition of purely ornamental and extraneous decoration, and organization of space to the best possible advantage. It has by now fortunately outgrown the bleakness, the angularity, the exaggerated "machine" effects which in its early days often limited its appeal. In the hands of the better contemporary designers, this style has become warm and gracious, with great flexibility and adaptability, and capable of providing an atmosphere of tranquillity and comfort. Since it utilizes modern scientific and engineering developments to increase the ease and efficiency of caring for the home, to add to its comfort and convenience, and to lengthen the life of all the materials employed, it deserves the careful consideration of the homemaker.

Characteristics of Modern include: bold and imaginative use of color, particularly in large plain areas with sharp contrasts and distinctive textures; preference for geometrical or large-scale impressionistic designs where pattern is desired; adaptation of plastics, glass, and metals to varied uses; woods finished in their natural tones and treated to bring out the beauty of the grain; simple, restful lines, combined with long sweeping curves, often in the flowing, irregular forms of nature; emphasis on comfort in chairs, couches, etc., achieved by following the natural lines of the body and using new materials such as lightweight metal or laminated wood for frames, and sponge rubber, which never loses its shape and resilience, for upholstery; wide use of space-and-labor-saving built-in furniture and ingenious double-duty equipment and furnishings; elimination of unnecessary decorations, which create a cluttered and restless effect, in favor of the inherent decorative values of useful materials, brought out by fine finishes or interesting textures.

Suitability, as a decorating term, refers to the special feature which distinguishes home decora-

tion from other forms of art. The difference is that the home decorator is concerned as much with practical problems of comfort and usefulness as with purely aesthetic considerations. In all successful home decorating—even in the most formal rooms—some form of utility must go hand-in-hand with beauty. In other words, suitability to use is the basic factor underlying all other considerations in home furnishings and decorating, with a special meaning for each type of room in the house. A carefully thought out decorating plan is essential, based upon suitability to the family's needs, tastes, finances, and prospects, as well as to the climate and environment of the home. A suitability check-list for each room would include the various activities to be carried on there, its size and proportions, its lighting facilities, the taste of its occupants, as well as an inventory of all furnishings and decorations which might have to be re-used, with or without refinishing.

Decorating fundamentals include certain helpful principles which should never be looked upon as hard-and-fast rules, but rather as a kind of success-insurance for making and carrying out a room-plan. An impression of *harmony*, or *unity of effect*, is essential to charm in any room, but it must be spiced with *interest* to prevent monotony. Professional decorators have found that they can rely upon a few basic principles to guide them in achieving these results, at the same time preventing mistakes of judgment. For the non-professional, the same principles can be reduced to simple, workable terms. Most important are *balance*, *line*, and *scale*, which play a vital part in the satisfactory arrangement of furnishings and other elements of decoration; these terms are explained further on in this article.

Decorating tools, such as *Color*, *Texture*, *Design* (pattern), and *Light*, must be understood if they are to be used effectively; but even a rudimentary knowledge, as outlined here, makes possible better results, and gives confidence to the non-professional home decorator.

Hints for Using Color: (1) One major color, one minor color, or possibly two, and one contrasting color, are enough for an average room. By major color is meant the one used in greatest quantity, not the most brilliant. The brighter the color, the smaller the amount necessary to use. (2) Color in a large area, as on a wall, always looks darker than in a small sample. (3) Light color makes a ceiling seem higher, dark color brings it down. (4) Soft, retreating wall colors, used with matching wood trim and drapery fabrics, increase the feeling of space. Strong, advancing colors, and sharp contrasts, lessen a room's apparent size. (5) A pleasing picture, fabric, rug, or piece of pottery may provide in-

spiration for a color scheme which can be built around it in a room.

Texture is an extremely useful tool for creating variety and interest, particularly in modern rooms or those where only one or two colors are used. Every surface in a room has a certain texture—soft, smooth, polished, dull, rough, coarse, or variegated—and each contributes a different element to the total effect. For example, shining surfaces, in fabrics, finishes, or metals, reflect light, while rough textures absorb it; that is, a satin fabric would appear lighter than a fuzzy chenille material of exactly the same shade. There are many attractive texture innovations in modern fabrics, wallpapers, carpet weaves, and wood finishes.

Design, or pattern, provides the easiest method for introducing variety, movement, and interest into a room, but it must be used with discrimination. Too much of it creates confusion. Some decorators feel that it is best to combine in a room only one large floral or pictorial design, one geometrical design, and necessary plain colors, adding one small scattered medallion-type pattern if more design seems needed. Large patterns are effective in large rooms, but make small rooms seem smaller; but small patterns may be lost in a large room. Other decorators object to following a rule which combines these elements. They claim that this combination if used by the inexperienced can produce a garish and restless effect, and that there are so few rooms in which plaids and geometric patterns look well that the use of another plain material would almost always be preferable.

Light is important, not only in itself but also because it has a definite effect on other aspects of decorating, such as suitability, arrangement, color, draperies, and fabrics. Dark rooms need light-reflecting colors—pastel tints with a good deal of white—while bright rooms may need dark background shades to prevent glare. The style and amount of draperies should be keyed to the amount of light needed from the windows; and mirrors placed at strategic points, facing windows or lamps, can be used to bring reflected light into dark corners. All colors and fabrics should be matched to the room where they are to be used, both by daylight and by lamplight. Not only the familiar incandescent light bulb, but also the more technically modern forms of artificial lighting, can be used to achieve dramatic effects.

Materials of decorating include: woods; finishes such as wallpaper and painted plaster; glass, metals, and plastics; floor coverings; textiles and trimmings; furniture and accessories. In each of these areas, modern developments have added new serviceability, new types of design, new easy-care features, and a greatly increased range of choice. Woods are no longer solid and unyielding

blocks, because synthetic bonding agents have made it possible to manufacture laminated sheets—stronger than solid wood—as well as exquisite pliable veneers. Water-thinned paints, varying from those which go on like enamel to those which look like rough plaster, may be easily applied by the inexperienced decorator and dry in a fraction of the time required for conventional types of paints. Metals and plastics have been adapted to every household use, from light, easily-moved furniture to indestructible dishes and stainless surfaces for walls, tables, and fabrics. Many wallpapers are now literally dirtproof, or washable. Long-wearing composition flooring materials are beautiful enough for living rooms, and soil-, acid-, and grease-resistant for kitchens. New soilproof processes applied to floor coverings and fabrics make light tones practical anywhere, and eliminate one of the most time-consuming tasks of housekeeping. Furniture makers are constantly improving, both in reproducing authentic values of traditional pieces and in adding new beauty and comfort in modern designs.

Home backgrounds include walls, ceilings, floors, doors, windows, and draperies. These must never be considered as separate entities in a room, but as a unified, harmonious setting for the picture. Plain, one-color walls create a sense of space, especially in light, cool, receding colors. Large pattern, or warm, dark color, brings the walls in. By combining one wall treatment from either group with three walls from the other group, the room can be made to seem longer or shorter. Plain walls are more restful, especially in neutral tones, and for that reason are usually preferred for living rooms or bedrooms which are in constant use. Dining rooms and hallways, on the other hand, may be dramatized with strong colors, contrasts, or bold patterns. A plain background, in a contrasting color, is the most effective foil for beautiful furnishings, but white or very light tones may reveal flaws and wear if furnishings and upholstery are not in the best condition; in such a case, a neutral harmonizing color is desirable. Except in special period interiors, ceilings are usually plain, in a lighter tone of the wall color. Exceptions occur when high ceilings need apparent lowering; this can be done by bold patterns or strong warm colors, contrasting with walls instead of harmonizing.

Bare floors, or those with plain-effect wall-to-

wall covering, make a room look larger; figured carpeting, a rug with a border of floor showing, or several small rugs, make it look smaller. Small rugs should always be made safe, by under-treatment or rug cushions, to prevent slipping; and they should never be placed diagonally to the walls except before a corner fireplace or a piece of furniture designed to fit into a corner. Woodwork in small rooms should match the walls; in larger rooms it can provide contrast if desired. Patterned walls call for plain or striped draperies. Plain walls need pattern or texture interest, in harmonizing or contrasting colors, depending upon the size of the room.

Draperies can often be used for changing bad window proportions, by extending them above or beyond the window itself with the help of modern fixtures designed to solve almost any kind of drapery problem. To be successful, curtains of any type or style must be long enough and full enough to be graceful; ample length and fullness in an attractive but inexpensive fabric is better than curtains too short or too narrow, even in the most beautiful material. Two simple rules help to insure attractive window draperies: (1) full-length curtains should reach just to the sill, or to the bottom of the apron below the sill, or to the floor—never stopping at any point between; (2) draped curtains should never be caught back in the middle of their length, but always at a point $\frac{1}{3}$ of the distance down from the top for "high draping," or $\frac{1}{3}$ up from the bottom for "low draping."

Mixing periods is the best way to achieve individuality and charm in a room. This can be done successfully by observing a few simple guiding principles, even when it involves the mingling of traditional and modern styles. Each period has its own distinctive *scale*, and certain predominant types of *line*, which make it harmonize well with periods of similar scale and line, and look out of place with others which are entirely different in

Courtesy Architectural Forum, photo by
Hedrich-Blessing

CHILDREN'S ROOM (right)

Double-decker beds and built-in cabinets in this room by architect George Fred Keck, Chicago, Illinois, leave the greatest possible amount of floor space as a play area. The floor is of serviceable tan-brown linoleum



DE COSTA

these respects. For example, the delicate, fine grace of Hepplewhite mahogany furniture combines well with Louis XVI or Directoire styles, in fine wood or painted finishes, but not with the massive bulk of Elizabethan English or French Empire pieces. On the other hand, the simple, sturdy oak and pine of Early American go well with the oak or walnut of French Provincial and English Tudor or Jacobean. The same rules apply to mingling traditional with modern—basic similarity in scale, line, and *feeling* are the guides to follow. *Balance* may be achieved by paying careful attention to the furniture groupings; avoid crowding all the heavy pieces of furniture into one end of a room or placing all the tall pieces along one wall.

Decoration Day, the day annually set apart in the U.S. for commemorating by appropriate exercises the services of fallen soldiers and sailors. The practice originated in the South before the conclusion of the Civil War, and for a number of years was observed by individual parties in the North. The widespread custom owes its origin to an official order issued in 1868 by Gen. Logan, then commander of the Grand Army of the Republic: "The 30th of May, 1868, is designated for the purpose of strewing with flowers or otherwise decorating the graves of comrades who died in defense of their country during the late rebellion, and whose bodies now lie buried in almost every city, village, hamlet, and churchyard in the land. In this observance no form of ceremony is prescribed, but posts and comrades will in their own way arrange such fitting services and testimonials of respect as circumstances will permit."

The day is usually called Decoration Day, though in some portions of the country the term Memorial Day is used. Different days were observed by the various states for some years, but as a rule the 30th of May has been adopted and is a legal holiday in most of the states of the Union. In the South it is commemorated by decorating the graves of those who fought to preserve the Confederacy. Usually the program includes processions, orations, and the floral decoration of the graves.

De Costa (*dê kōs'tà*), BENJAMIN FRANKLIN, clergyman, born at Charlestown, Mass., July 10, 1831; died Nov. 4, 1904. He entered the ministry of the Protestant Episcopal Church (1857), after graduating from the Biblical Institute at Concord, N.H. He was rector at North Adams and at

Courtesy Bloomingdale Bros., Inc., N. Y. Photo by R.A. Smith

MODERN LIVING ROOM (left)

The bold use of color in large areas, the sharp contrasts in textures and patterns, the use of natural woods and of ornamental forms against plain areas are all characteristic of modern decoration

Courtesy W. & J. Sloane, N. Y. Photo by F.M. Demarest

DINING ROOM: FRENCH PROVINCIAL

The slightly curved furniture lines and the use of striped materials identify the style of this pleasant dining room as French Provincial, the least ornate of the 18th-century French styles. The pieces shown are all reproductions

Courtesy W. & J. Sloane, N. Y. Photo by F.M. Demarest

LIBRARY: 18TH-CENTURY ENGLISH

The step table (left) and the drop-leaf table (right), as well as the bell pulls on the wall, are authentic 18th-century English pieces. The other furnishings in this friendly library corner are reproductions in the mood of the same period

Newton Lower Falls, Mass., and entered the Massachusetts infantry as chaplain in the Civil War. Leaving the army (1863), he became editor of the *Christian Times* and later of the *Episcopalian* and the *Magazine of American History*. He was rector at St. John's the Evangelist, New York City (1881-99), resigning after his conversion to Catholicism. He became an authority on early American cartography and exploration. His publications include "The Pre-Columbian Discovery of America by the Northmen," "The Rector of Roxburgh," and "The Moabite Stone."

Decoy (*dē-koi'*), a contrivance to entice wild game into a snare, or lure it to come within the range of a weapon. Decoys differ according to the game to be secured. Success in decoying game depends to a considerable extent upon close observation of animals and mechanical skill in constructing the contrivances. Wild ducks are attracted by decoys which closely resemble the living animals. They are placed in the water near the shore so that they appear to be swimming. In this way it is possible to entice the ducks to alight, bringing them within gun range of concealed hunters. Other decoys of a similar kind are used to lure geese, brant, and prairie chickens.

De Creff (*dē krēf'*), JOSÉ, sculptor, born at Guadalajara, Spain, Nov. 27, 1884. He went to Paris to study art at the Académie Julien (1906-07). Concentrating on sculpture, although he is also a water colorist, De Creff has developed into a master craftsman and artist using the direct method of sculpture; *i.e.*, without modeling a figure in clay and then having it cast, he works directly on the metal, stone or wood. Since coming to the U.S. (1929), he has had several exhibits. His "Maternity," which won first prize in a Metropolitan Museum competition (1942), is now a part of the Metropolitan's permanent collection. In addition to his work as a sculptor, De Creff teaches at the New School for Social Research and at the Art Students League, New York City.

Dedham (*dēd'am*), county seat of Norfolk County, Massachusetts, 10 m. s.w. of Boston, on the Charles River and on the New York, New Haven & Hartford R.R. Among the noteworthy buildings are the courthouse, the public library, the town hall, the Historical Society building, and several churches. Manufactures include pottery, dyeing plant products, cotton goods, and machinery. The first public school supported by a general tax in America was established (1644) at Dedham. Population, 1950, 18,437.

Dee (*dē*), a river of England and Wales, rises in Lake Bala, Merionethshire, and flows by an estuary into the Irish Sea, about 20 m. below Chester. A canal 7 m. long extends from Chester to the estuary. The river is about 70 m. long and

is connected by canals with the rivers of central England.

Dee, a river of Scotland, rises in the vicinity of Ben Macdhu, and flows into the North Sea at the harbor of Aberdeen. Balmoral Castle is on its banks. It is about 90 m. long. Another river of Scotland called Dee rises near the northern boundary of Kirkcudbrightshire, and after a course of about 48 m. flows into the Solway Firth. About 7 m. of its lower course is navigable.

Deed (*dēd*), an instrument in writing, signed and delivered by the party transferring to the donee or purchaser, conveying title to real estate. In some countries it is necessary that the deed be executed under seal, but in others private seals have been abolished, hence a deed conveying land may or may not have a seal, depending upon the state or country where it is executed. In most states it consists of an instrument in writing that has been acknowledged before a notary public or other competent officer, who certifies to it under his seal or official signature. A *warranty deed* is one in which the party conveying title agrees to defend it against all claimants, while a *quitclaim deed* conveys only what title may be in the party making the deed. A *deed of trust* is similar to a mortgage, the title depending upon the payment of money from the seller to the purchaser. Instruments of this kind, to be valid in some states, must be witnessed by two persons. It is generally required that the wife join the grantor, if he is married, in making the deed, and it must be recorded in the office of the county recorder, the register of deeds, or the town clerk.

Deems (*dēmz*), CHARLES FORCE, clergyman and educator, born at Baltimore, Md., Dec. 4, 1820; died Nov. 18, 1893. He graduated from Dickinson Coll. in 1839, entered the Methodist Episcopal ministry, and engaged in pastoral work until 1842. In that year he was appointed professor of logic at the Univ. of North Carolina, and in 1845 became professor of chemistry at Randolph-Macon Coll. In 1855 he resumed pastoral work and founded the undenominational Church of Strangers in New York City (1868), of which he was pastor until his death. In 1881 he founded the American Inst. of Christian Philosophy. Among his writings are "Life of Jesus" (1872) and "The Gospel of Common Sense" (1888). He was editor at different times of the *Annals of Southern Methodism*, and the *Southern Methodist Episcopal Pulpit*.

Deer (*dēr*), a family of ruminant mammals, most species of which are distinguished by deciduous branching horns or antlers. The antlers are solid structures growing from the frontal bone, with many branches and tines, growing to an enormous size. They appear the second spring and are shed each year. In the *reindeer* both male and female bear antlers, while in other spe-

cies the female is without antlers. The beam, or stem of the antler, appears in the first year of growth; in the second year a basal branch appears, the following year a second branch; in successive years a varying number of subdivisions grows from the main beam. Each year's growth is at first covered with a sensitive, velvetlike skin; later this dries and peels off, and a bony ridge forms on the antlers just above the base of attachment to the frontal bone. The *water deer* of China and the *musk deer* have no antlers. There are no deer in Australia and only a few species are found in Africa, but they are widely distributed in many portions of the other continents and in some of the islands. Among the smallest of the family are the Indian *muntjacks*; and the largest are the *moose* or *true elk*. Some of the species common to the colder latitudes are the *reindeer*, *elk*, *caribou*, and *moose*; and in the temperate and warmer regions are found the *red deer*, *fallow deer*, *roe deer*, and *muntjack*. The *red deer* female is known as a *hind* and the male as a *stag*; the latter has large antlers.

The deer family has sharp, cleft hoofs and two-toed feet. In most species the ears are large and the hair is crisp and thick. Deer vary in color, though they are mostly reddish-brown with white spots. The senses of sight, hearing, and smell are highly developed, enabling the animals to guard against their enemies. Swamps, plains, and forests are favorite haunts, though deer are seen mostly on heights in the daytime; from these they can take a survey of the landscape and guard against danger. They are fleet of foot, moving with remarkable speed when danger confronts them. Their ability to swim is also highly developed. The young are born in the spring and kept in a secluded place, which is visited only at odd times during the day by the mother, although she remains there at night. The food consists of grasses during the warmer season, and of bark, tufts of dried grass, and rushes during the winter. Although deer are easily tamed, the reindeer is the only one of the group that has been completely domesticated.

Deer Mouse (*dēr mous*) or JUMPING MOUSE, any of a class of small mice so named for their color resemblance to the deer. They are about 4 in. long and have a tail somewhat longer than the body; the hind legs are longer than the fore legs. The deer mouse of Canada is a representative species. It is able to jump 10 ft. at a bound. Other species are found in various parts of Mexico and the U.S. All are rodents that show a close resemblance to the jerboas.

De Falla (*dā fāl'lyā*), MANUEL. See *Falla*, Manuel de.

Defamation (*dēf-ə-mā'shūn*), a statement that harms someone's reputation or exposes him to hatred, ridicule, or contempt. Defamation in

writing or some other permanent form is known as libel, while spoken defamation is called slander. See also *Libel*.

Default (*dē-fōlt'*), the failure to fulfill a financial, contractual, or legal obligation; the failure of a defendant or plaintiff to appear in court at the appointed time, making himself liable to being nonsuited or having the case decided against him; or the failure of a person, such as a public official, to comply with a statute.

In sports, a default occurs if a contestant fails to compete in or to finish a contest and so forfeits it.

Defauw (*dē-fō'*), DÉSIÉ, conductor and violinist, born in Ghent, Belgium, Sept. 5, 1885; died in Gary, Ind., July 25, 1960. At the age of eight, he began his musical studies at the Ghent Conservatory, and at 15 he conducted the Concerts d'Hiver in Ghent. He toured Europe as a violinist until the outbreak of World War I. During the war he formed a string quartet and toured England. Between the two World Wars, he conducted orchestras in Belgium.

He made his American debut as a guest conductor of the N.B.C. Symphony Orchestra in 1939, and from 1943 to 1947 he conducted the Chicago Symphony Orchestra. He went to Gary, Ind., in 1952 and was conducting the Gary Symphony Orchestra in 1959 when he was forced to retire due to ill health.

Defender of the Faith (*dē-fēnd'ēr of the fāth*), the title given Henry VIII of England (1521) by Pope Leo X, as a reward for his treatise against Martin Luther (*q.v.*); since 1544, it has been used by succeeding British monarchs.

Defense (*dē-fēns'*), CIVIL. See *Civil Defense*.

Defense, U.S. DEPARTMENT OF, a department of the Federal government, established Aug. 22, 1949, by amendments to the National Security Act of 1947, to effect integrated policies and procedures for the departments, agencies, and functions of the U.S. government relating to the national security.

See *National Military Establishment*; *United States, Departments of*.

Defense Mobilization, OFFICE OF, an agency of the Federal government, established in 1953, as a policy planning and coordinating agency. With many other bureaus engaged in the civilian defense field, it was incorporated (1958) into the Office of Civil and Defense Mobilization, established to centralize authority for nonmilitary defense functions.

Defiance (*dē-fī'əns*), a city in northwestern Ohio, seat of Defiance County, about 50 m. s.w. of Toledo, at the confluence of the Auglaize, Tiffin, and Maumee rivers. It is served by the Baltimore & Ohio and Wabash (freight) R.R.'s. Located in an agricultural area, the city is industrial and produces steel, machinery, hardware,

auto, airplane, and radio parts, household appliances, and food and dairy products. In 1958 its value added by manufacture was \$15,503,000. The city is the seat of Defiance Coll. Ft. Defiance was built here in 1794. The city was settled ca. 1790 and first incorporated in 1836. Population, 1960, 14,553.

Deflation (*dē-flā'shūn*), a rise in the value of currency resulting from the fall of prices of commodities, as opposed to inflation (*q.v.*) when the value of money goes down and the prices go up.

Defoe (*dē-fō'*), DANIEL, journalist and novelist, born in London, England, in 1660 or 1661; died April 26, 1731. The son of a butcher, he was himself a tradesman who engaged in many trades, and who resented all his life that he was not a "gentleman." He added the prefix *De* to his father's name (Foe), perhaps pretending to Norman ancestry. Defoe was educated at a school for dissenting ministers conducted by Charles Morton, who later emigrated to America and became vice president of Harvard Univ. Morton was unusual among schoolmasters of his time because he stressed English rather than Latin and Greek. Because he was a dissenter, Defoe was not eligible for education at Oxford or Cambridge. In literary controversy, he often boasted of his learning and was sneered at for his ignorance. An incorrigible speculator, Defoe set out to make his fortune as an importer of hosiery and other commodities. In 1692 he found himself bankrupt, failing for the sum of £17,000, most of which he later repaid.

By the end of the century, Defoe was an active political pamphleteer, writing for the Whig party. His first book, "An Essay upon Projects" (1698), indicates the range of his interests. He discusses public highways, slavery, prison reform, banking, insurance, bankruptcy laws, insane asylums, education for women, and a variety of other subjects. A series of more controversial pamphlets which followed treat an equal variety of subjects. "The True-Born Englishman" (1701) was a satirical poem ridiculing those who opposed King William III on the ground of his foreign birth by showing how many foreign strains make up every "true-born Englishman." Defoe's most famous pamphlet, "The Shortest Way With Dissenters" (1702), was an ironic attack upon the Tory policy of suppressing Nonconformists. The two pamphlets established Defoe's reputation, but for writing "The Shortest Way" he was arrested, pilloried, fined, and imprisoned. In prison he began a paper, *The Review*, which he wrote and published weekly for nine years.

After his release from prison in 1703, through the intervention of Robert Harley, a Tory statesman, Defoe undertook a variety of journalistic jobs, serving each party at times.

Most of Defoe's writings were political controversy, but aside from his novels his important



FRONTISPIECE FOR "ROBINSON CRUSOE"

From a late 18th cent. edition.

works also include a number of religious and moral tracts; "The Journal of the Plague Year" (1722), a brilliant fictionalized account of the great plague which has all the validity of history; "The Complete English Tradesman" (1725), a volume of advice to businessmen, much of which is still sound; and the unfinished "Complete English Gentleman," a guide for education and conduct.

It is for his novels that Defoe is best remembered. These, the work of his later years, include "Robinson Crusoe" (1719), written when he was 59, "Captain Singleton" (1720), "Moll Flanders" (1722), and "Roxana" (1724). "Robinson Crusoe," of course, is his best-known work; but "Moll Flanders" in its different way is equally good, even though not well-suited for children; and all of Defoe's fiction has the merits of vigorous, simple style, rapid narrative, and the most convincing wealth of circumstantial detail. A journalist by profession and habit, Defoe wrote fiction as if it were biography. He expected his stories to be believed, and his readers find it difficult not to believe them.

De Forest (*dē fōr'ēst*), LEE, inventor, born in Council Bluffs, Iowa, Aug. 26, 1873; died in Hollywood, Calif., June 30, 1961. He was graduated from Yale Univ. in 1896 and became noted for inventions in radio, e.g., the audion tube, and the "glow-light" method (1923) for making film sound-track. De Forest's inventions (in-



Courtesy Metropolitan Museum of Art, N. Y.

EDGAR DEGAS. SELF-PORTRAIT

cluding "FM" or frequency modulation) number over 300.

Degas (*dě-gă*'), HILAIRE GERMAIN EDGAR, painter, born at Paris, France, July 19, 1834; died Sept. 27, 1917. Although he is generally linked with Impressionism, the style he adopted in his later years, his academic training and his intensive studies of such masters as Holbein the Younger, the Italian 15th-century painters, and Ingres (*q.v.*) preserved in him a strong sense of form and design. He was continually preoccupied with the delineation of form. Best known for his scenes from the ballet, the dancing school, and the races, Degas caught the informality of the passing moment in line and color. His theater and ballet scenes, his excellent portrait studies, and his *genre* scenes, all executed in various media—oil, pastel, water color, pencil—give proof of the wide range of his art. Degas was one of the few French 19th-century artists who visited the U.S., and it is from this visit that his "Cotton Exchange at New Orleans" resulted. Such works as "At the Milliner's," "Rehearsal of the Ballet on the Stage," "The Dancing Class," and "Henri de Gas and His Niece Lucy" may best illustrate his art. See also color plate, *Great Paintings II*, Volume XII.

De Gasperi (*dă găs'pě-rî*), ALCIDE, statesman, born in Trento, Austria (now Italy), April 3, 1881; died in Sella Val Sugana, Italy, Aug. 19, 1954. After studying at the Univ. of Vienna, he edited a newspaper, then was elected, as an Italian representative, to the Austrian parliament. When his native province was united with Italy, he served in the Italian assembly. He helped in founding the Christian Democratic party and became its leader after World War II. For his

DE GAULLE

opposition to Fascist policies he was sentenced to four years in prison in 1926. After his release he worked in the Vatican Library. During World War II he was active in the anti-German underground, and, in 1944, he joined the Bonomi government. After 1945 he headed a series of cabinets which made strong efforts to revive Italy's economy and keep the country free of Communist control. De Gasperi remained neutral in Italy's internal struggle over the ousting of the monarchy and devoted himself to the successful conclusion of the Marshall Plan and the strengthening of Western European solidarity.

De Gaulle (*dě gâl'*), CHARLES ANDRÉ JOSEPH MARIE, soldier, politician, born in Lille, France, Nov. 22, 1890. He was graduated from St.-Cyr, the French military academy, in 1911, served in World War I, in Poland in 1921, and later in different staff positions and with French military missions. In 1933 he became secretary general of the National Defense Council and, as such, urged, unsuccessfully, the mechanization of the French forces. Made brigadier general in 1940, he was later under secretary of war.

Shortly before the Franco-German armistice (June 1940), he went to London on government business and did not return. He organized there the Free French forces, who, with the help of some French overseas territories, continued to fight the Axis Powers (*q.v.*). In 1941 he formed the Free French National Council and, in 1943, with Gen. Henri Giraud (*q.v.*), headed a newly organized Free French committee in Algiers. During the liberation of France in 1944, the committee became the provisional government of France; De Gaulle headed it until 1946, when

CHARLES DE GAULLE

Courtesy French Press & Information Service, N. Y.



he lost support for his constitutional proposal for a powerful chief executive. After that, his political influence waned, and it was not until 1958 that he returned actively to the political scene. The failure of successive French cabinets to overcome or settle peacefully the Arab revolt in Algiers (*q.v.*), the resulting dissatisfaction of the armed forces, and the threatened disintegration of the French economy returned him to the premiership on June 1, 1958, with the right to rule by decree temporarily, and to the presidency in 1959.

Degeneracy (*dē-jēn'ēr-g-sy*), a condition in which an individual fails to develop to a standard which is normal for the family or group. It exists in the hereditary epileptic, the congenital syphilitic, and in two types of the mentally deficient—the idiot (*q.v.*) and the imbecile (see *Feeble-Mindedness*). Such conditions are caused by actual organic damage, due to birth injuries, childhood fevers, and infrequently to later head injuries and brain tumors. The term should not be used to describe socially deviant behavior, such as murder, alcoholism, or sex perversion if such a state has not been caused by organic deficiency.

Degeneration (*dē-jēn-ēr-d'shūn*), a term used in medicine to refer to changes in the structure and function of the body cells by replacement of the normal constituents by albuminous matter, fat cells, mucous, colloid material, or amyloid substance. Lack of sufficient or proper nutrition, accumulation of excessive waste matter, exposure to poisons, infections, excessive heat, cold, or pressure, or prolonged chronic wasting diseases may be the cause. *Albuminous degeneration* most frequently affects the cells of the kidney, liver, and muscle tissue. In *fatty degeneration*, fat droplets are deposited in the cell cytoplasm, muscle tissue being most frequently affected. In *amyloid degeneration*, the walls of the blood vessels, primarily of the liver, spleen, and kidneys, are thickened by a firm, glossy material. Degeneration may be reversible, and the cells may recover, but the process may be progressive, ultimately leading to death.

Degree (*dē-grē'*), a word meaning a measure of anything, but used particularly in measuring angles and temperature. See also *Angle*.

An angle of one degree, written 1° , is the 90th part of a right angle, which is the corner of a square (or the 360th part of a circle). Thus we speak of angles of 45° (half a right angle) or of 60° (the angle of an equilateral triangle). Measurement in degrees can be extended to the earth's surface (see *Latitude*; *Longitude*).

The word degree is also used in algebra as the sum of the exponents of the variables in a term (thus, the degree of x^3y^2 is 5).

In education, a degree is a mark of distinction bestowed upon a student on the completion of

certain academic requirements or conferred upon distinguished persons as an honor. Degrees of *bachelor*, *master*, and *doctor* are given in all branches of the arts, sciences, medicine, law, and divinity.

For the use of degree in the measurement of temperature, see *Temperature*.

De Haven (*dē hā'ven*), EDWIN JESSE, explorer, born in Philadelphia, Pa., May 7, 1816; died May 1, 1865. He became (1829) a midshipman in the U.S. Navy; he later sailed as acting master with the Wilkes expedition which explored (1839-42) the Pacific and Antarctica. In 1850 he led an expedition to search for the lost arctic explorer, Sir John Franklin. Although he did not find Franklin, he discovered Grinnell Land, an arctic region.

Dehmel (*dā'mel*), RICHARD, poet, born in Wendisch-Helmsdorf, Germany, Nov. 11, 1863; died in Berlin, Feb. 8, 1920. After studying economics, natural science, and philosophy, he was secretary of an insurance company (1887-95). Dehmel's early poems date from this period. "*Erlösungen*" appeared in 1891, followed by "*Aber die Liebe*" (1893), and "*Weib und Welt*" (1896). Although he wrote several dramatic works, including "*Lucifer*" (1899), he was essentially a lyric poet whose explosive emotional power represented a romantic revolt against literary naturalism.

De Hooch (*dē hōk'*), PIETER. See *Hooch, Pieter De*.

Dehn (*dān*), ADOLF ARTHUR, painter and lithographer, born in Waterville, Minn., Nov. 22, 1895. After a period of experimental work, Dehn went to Germany in 1921, where socially conscious painters like George Grosz (*q.v.*) influenced his lithographs and water colors of the 1920's and '30's. Dehn is best known, however, for his brilliant water-color technique, seen in his rural landscapes of the Midwest or in his satiric canvases.

Dehydration (*dē-hī-drā'shūn*), the process of

FRESH AND DEHYDRATED MILK

U. S. Army Signal Corps Photo



drying or rendering free of water, more specifically by exposure to circulating heated air or gas or by heating in a vacuum. The term refers, in practice, mainly to the production of dry food products, such as powdered milk and eggs, dehydrated vegetables, prepared soup powders, fruit powders, and coffee extract powders. A distinction is usually made between dehydrated foods such as the foregoing, and "dried" foods such as raisins and prunes and certain meat and fish products, primarily on the basis of a relatively high moisture content in the "dried" foods.

The saving in weight and space occupied, and the slowing down in rate of spoilage when nearly all moisture is removed, have made dehydrated foods essential in military rations. A recent development, called *dehydrefreezing*, combines partial dehydration of food products, in order to conserve weight and space, with preservation by freezing.

Deism (*dē'iz'm*), the tenets or doctrines of a deist. This system of belief admits the being of a God and acknowledges a number of his perfections, but does not hold to the existence and necessity of a divine revelation.

De Kalb (*dē kāl'b*'), a city in De Kalb County, Illinois, in the northern part of the state, about 58 m. w. of Chicago. It is on the Chicago Great Western and the Chicago & North Western railroads. The manufactures include pianos, accordions, mattresses, springs, and laundry motors. De Kalb is the seat of the Northern Illinois State Teachers Coll. It was settled in 1838 and incorporated in 1877. Population, 1950, 11,708.

De Kalb, JOHANN, BARON, general, born in Hüttendorf, Germany, June 29, 1721; died Aug. 19, 1780. He joined the American forces under George Washington and was made major general by Congress. He was sent to reinforce Gen. Lincoln at Charleston in 1780, but did not reach him in time. Subsequently he was second commander to Gen. Gates at the Battle of Camden and commanded the troops of Maryland and Delaware. While resisting an attack by Cornwallis on Aug. 16, 1780, he was severely wounded and died three days later. A monument was erected to his memory in Camden, N. J.

Dekker (*dēk'ēr*), THOMAS. See *Decker*, Thomas.

De Kleine (*dē klīn'*), WILLIAM, physician, born in Jamestown, Mich., Nov. 28, 1877; died in Cheektowaga, N.Y., Sept. 20, 1957. He received his M.D. from Northwestern Univ. (1906). De Kleine was health officer of Flint, Mich. (1917-22), and of Saginaw, Mich. (1922-25). During the great Mississippi flood of 1927, he became associated with the American Red Cross, serving as medical director from 1928 to 1942. In that capacity, he participated in all recent major disasters as organizer of medical relief. From 1944 to 1947 he was Michigan state commissioner of

health. A pioneer in the field of public health, he advocated mobile tuberculosis clinics and nutritional therapy.

Dekoven (*dē-kō'ven*), HENRY LOUIS REGINALD, composer, born in Middletown, Connecticut, Apr. 3, 1859, died Jan. 16, 1920. He was taken to England when 13 years old and was educated at St. John's Coll., Oxford. He later studied piano, harmony, voice, and composition at Stuttgart, Paris, Vienna, and Florence. Returning to the U.S., he began to compose light operas and was music critic for several newspapers including the *Chicago Evening Post* (1889-90) and the *New York World* (1898-1900, 1907-12). He organized and conducted (1902-05) the Philharmonic Orchestra, Washington, D.C. Among his best-known works are "Robin Hood," "Rob Roy," and "Maid Marian."

De Kruif (*dē krīf'*), PAUL, bacteriologist and author, born at Zeeland, Mich., Mar. 2, 1890. He received his B.S. degree from the Univ. of Michigan (1912) and was a bacteriologist at the university (1912-17) and at the Rockefeller Institute (1920-1922). In 1925 he joined the reportorial staff of the Curtis Publishing Co. Among his books are "Our Medicine Men" (1922), "Microbe Hunters" (1926), "Hunger Fighters" (1928), "Seven Iron Men" (1929), "Men Against Death" (1932), "The Fight for Life" (1939), and "The Male Hormone" (1945). Entering the social welfare field, he championed hospitalization and medical care plans for the masses in "Kaiser Wakes the Doctors" (1943).

Delacroix (*dē-lā-krwā'*), FERDINAND VICTOR EUGÈNE, painter, born near Paris, France, Apr. 26, 1798; died Aug. 13, 1863. He began study under Pierre Guérin at the age of 18, became highly skilled as a painter, and in 1822 exhibited his first important work, "Dante and Vergil." He must be considered the leader of the Romantic School of painting in France in the early 19th century, his work breaking the all-comprehensive rule of the classicists from David through Ingres (*qq.v.*). His power of imagination and the strong dynamics of his composition are equaled by his potent color scheme and his excellent draftsmanship. Among his paintings are "The Massacre of Chios," "The Capture of Constantinople by the Crusaders," and "Battle of Taillebourg."

Delagoa Bay (*dēl-ā-gō'ā*), an indentation extending from the Indian Ocean into the coast of southeastern Africa. It is about 40 m. long and from 16 to 20 m. wide. The Crocodile, Maputa, and other rivers flow into it. At the northern end is the town of Lourenço Marques, one of the chief ports of South Africa. This port is of special importance because it is only 52 m. from the Transvaal and about 350 from Pretoria, with which it is connected by railroads. Delagoa Bay is immediately south of Portuguese South Africa



Courtesy Metropolitan Museum of Art, N. Y.

LITHOGRAPH BY EUGÈNE DELACROIX

Hamlet Struggling to Follow his Father's Ghost

and is under the control of Portugal. It provides an excellent harbor and accommodates vessels of large tonnage. The bay was discovered in 1502 by the Portuguese explorer Antonio do Campo. Sovereignty was disputed between Portugal and Great Britain until the conflicting claims were submitted (1872) for arbitration to France, who awarded it to Portugal in 1875.

De la Mare (*də lā mār*), WALTER JOHN, poet and novelist, born in Charlton, England, April 25, 1873; died in Twickenham, June 22, 1956. He was educated at the St. Paul's Cathedral Choir School. He worked as a bookkeeper (1890-1908), later devoting all of his time to writing. His early books—"Songs of Childhood" (1902), "Henry Brocken" (1904), a novel, and "Poems" (1906)—reveal the imaginative power and delight in fantasy which characterize all his work. Essentially a lyric poet, de la Mare displayed a mastery of symbolism in prose and poetry and became noted for the musical qualities of his verse. Later works include the novel "Memoirs of a Midget" (1921); "Private View" (1953), a collection of essays; several children's stories; and many volumes of poetry, e.g., "Winged Chariot" (1951).

Deland, MARGARETTA WADE (CAMPBELL), novelist and poet, born in Allegheny, Pa., Feb. 28, 1857; died in Boston, Mass., Jan. 13, 1945. She attended private schools, studied art at Cooper Union, New York City, and taught drawing until her marriage in 1880 to Lorin F. Deland. Her first novel, "John Ward, Preacher" (1888), is realistic in approach, but most of her many other works are tender and nostalgic in tone, e.g., "Old Chester Tales" (1919).

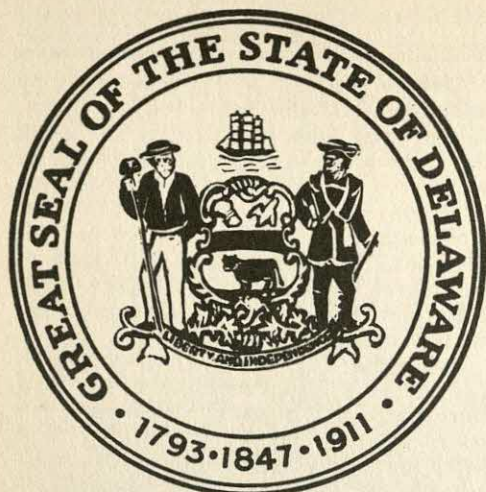
Delany (*dē-lā'nī*), MARTIN ROBINSON, Negro leader, born in Charles Town, Va., May 6, 1812; died in Xenia, Ohio, Jan. 24, 1885. The son of free Negroes, he was educated in Pittsburgh and worked as a journalist before studying medicine at Harvard Univ. In the Civil War he served as a physician in the Union army. His book "The Condition, Elevation, Emigration, and Destiny of the Colored People of the United States, Politically Considered" (1852) reflects his concern for the betterment of the Negro.

Delaroché (*dē-lā-rôsh'*), HIPPOLYTE PAUL, painter, born at Paris, France, July 17, 1797; died there, Nov. 4, 1856. He studied at Paris and first attracted notice in 1822 with the painting "Joash Saved from Death by Jehoshabab." Delaroché's concepts were picturesque, often sensational, his highly finished coloring pleasing, and the execution accurate. Most of his subjects were historical, and among his many works are "Cromwell at the Coffin of Charles I" (1831) and "The Children of Edward IV" (1830).

De la Roche, MAZO, novelist, born in Newmarket, Ont., Jan. 15, 1879; died in Toronto, July 12, 1961. After attending the Univ. of Toronto, she published "Explorers of the Dawn," short stories, in 1922, and "Possession," a novel, in 1923. "Jalna," dealing with the fictional Whiteoak family, won the *Atlantic Monthly* novel contest (1927); it became the first of a series of 16 popular novels on this subject, ending with "Morning at Jalna" (1960). Her autobiography "Ringing the Changes" appeared in 1957.

Delaware (*dēl'ə-wār*), a river in the eastern part of the U.S., rising (in southern New York State) in east and west branches which meet at Hancock, N.Y., and flow southward ca. 300 m. to Delaware Bay. It separates New York and New Jersey (on the eastern bank) from Pennsylvania and Delaware (on the western bank) and flows through the Delaware Water Gap near Stroudsburg, Pa. Among the cities on its banks are Easton, Trenton, Camden, Philadelphia, Wilmington, and New Castle. The river is tidal to Trenton and navigable for ocean steamships as far as Philadelphia; the U.S. government built a channel 32 ft. deep and 600 ft. wide from Delaware Bay to Philadelphia, and a 12-ft.-deep channel from there to Trenton. The Chesapeake and Delaware Canal, south of Wilmington, connects it with the head of Chesapeake Bay. Its chief tributaries are the Lehigh and the Schuylkill. The Dutch explored the river in the 17th century. George Washington's famous crossing of the Delaware took place Dec. 25, 1776, near Trenton.

Delaware, a state in the South Atlantic section of the U.S., one of the 13 original states of the Union and the first to ratify the Federal Constitution. Best known for its varied chemical industry, Delaware is also an important producer

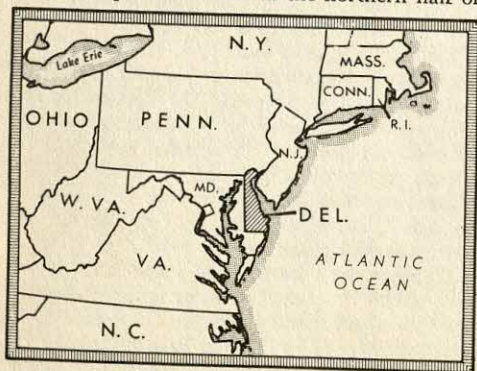


of foods, in particular, of poultry and sea food.

Delaware is bounded on the n. by Pennsylvania; on the e. by New Jersey, Delaware Bay, and the Atlantic Ocean; on the s. by Maryland; and on the w. by Maryland and Pennsylvania. It ranks 49th in size among the states and 47th in population, according to the 1960 Decennial Census of Population (the District of Columbia is included in both of these rankings). The state of Delaware was named for the first governor of Virginia, Thomas West, Baron De La Warr. The state's nicknames are the "First State," from the order in which it joined the Union; the "Diamond State," from Thomas Jefferson's allusion to it as "the diamond in the coronet of the States"; and the "Blue Hen State," a reference to the bravery of its Revolutionary troops, who, according to tradition, were compared to one of the companies' gamecocks.

GEOGRAPHY

Delaware's terrain is generally low and flat, no part of the state rising more than 440 ft. above sea level. The mean altitude of the state is only 60 ft. Only the northwestern corner, a region of low, rolling, wooded hills, lies outside the Atlantic coastal plain. The soil in the northern half of



DELAWARE

the state is a clay loam, suitable for dairying, poultry raising, and truck and grain farming. The soil of the southern region is a sandy loam, which makes good pasturage and yields such crops as grain, apples, soybeans, and vegetables.

Location	Between 75°3' and 75°47' W. long. and 38°27' and 39°48' N. lat.
Area	2,057 sq. m.
Land	1,978 sq. m.
Inland water	79 sq. m.
Greatest extent:	
North to south	96 m.
East to west	35 m.
Population (1960)	446,292
Capital city	Dover
Highest point	Near Centerville (450 ft.)
Lowest point	Sea level (Atlantic Ocean)
Entered the Union (1st state)	1787
Song	"Our Delaware," words by George B. Hynson, music by Will M. S. Brown
Flower	Peach blossom
Bird	Blue hen chicken
Motto	"Liberty and Independence"
Flag	See color plate in Vol. XI

Southern Delaware is also the center for broiler-chicken production, the leading agricultural operation of the state.

The metropolitan area of the state is located in northern Delaware. The chief city is Wilmington, an ocean port and the center of diversified manufacturing. Its metropolitan area includes all northern New Castle County. The Chesapeake and Delaware Canal, which links the Delaware River and Chesapeake Bay, runs across the narrow neck of the Delaware Peninsula. Delaware Bay yields a rich harvest of shellfish, such as clams, oysters, crabs, and lobsters. Quantities of edible fish, and menhaden for oil and fertilizer, are taken in offshore waters. Lewes is one of the major fishing ports of the U.S. Most of the state's rivers drain into the Delaware River; the Christina, which joins the Delaware at Wilmington, is the most important tributary. Most of the coast of Delaware south of the Chesapeake and Delaware Canal is marshy, but where Delaware Bay opens into the Atlantic Ocean, sandy beaches attract many summer visitors.

The Delaware Memorial Bridge, completed in 1951, is one of the country's largest suspension bridges. It connects Delaware with New Jersey and provides fast transportation for the state's industrial and agricultural products to the vast markets of the New York metropolitan area.

Buildings that date from colonial times are found throughout Delaware. A four-block area of central New Castle comprises a unique example of a colonial capital in virtually its late-18th-century form. Its Old Court House was the capital until 1777. In Dover, the Green retains a number of pre-Revolutionary homes and the Old State House, rebuilt in 1787 on 1722 foundations,

the second-oldest statehouse still in active administrative use. Near Dover is the home of John Dickinson, the "Penman of the Revolution." A number of colonial and Federal dwellings are also found in the vicinity of Odessa and Lewes. Zwaanendael House, in Lewes, a replica of the town hall at Hoorn, The Netherlands, was built in 1931 to commemorate the Dutch settlement of Delaware in 1631. Old Swedes (Holy Trinity) Church, said to be the oldest Protestant church in the U.S., has been in continuous use since it was built in 1698.

The chemical and munitions industries have long been important in Wilmington, now a major chemical center. Some of the powder mills built by E. I. du Pont de Nemours & Co. along the Brandywine, between 1802 and 1850, are still standing. There are modern laboratories of this and other companies in Wilmington's suburbs, and the central offices are in the city.

Climate: The state has a temperate climate. Winters are moderate, and summers are warm but not uncomfortable. The proximity of the water to all points in Delaware tends to level out extremes of temperature. Rainfall is adequate for farming throughout the state, the season of greatest rainfall being July to August.

Normal temperature, Wilmington	
January	33.3° F.
July	75.9° F.
Annual mean	54.2° F.
Latest frost, Wilmington	
	May 9
Earliest frost, Wilmington	
	Sept. 27
Precipitation, Wilmington	
January	3.56 in.
July	4.49 in.
Annual	44.50 in.
Average growing season, Wilmington	
	197 days

NATURAL RESOURCES

The sandy loam soil of southern Delaware is well suited to truck-garden crops, which are canned or frozen in nearby plants. Fresh fruits and vegetables can reach New York, Philadelphia, and Baltimore markets in two to five hours.

The clay soil of northern Delaware and this section's nearness to the large cities have made it important as a pasture land for dairy cattle and as a poultry-raising area. The state's production of corn and other grains cannot meet the demands of the poultry and egg farms, and

ANNUAL STATE EVENTS

Old Dover Days	First Saturday and Sunday in May; Dover; old houses and gardens opened to the public
Old New Castle Day	Third Saturday in May; New Castle; old houses opened to the public
Horse Racing	June; Delaware Park, Stanton
Kent County Fair	Last week in July; Harrington
Harness Racing	September; Brandywine Raceway, Wilmington
Delaware Day	Dec. 7; statewide; commemorating Delaware's ratification of the Constitution

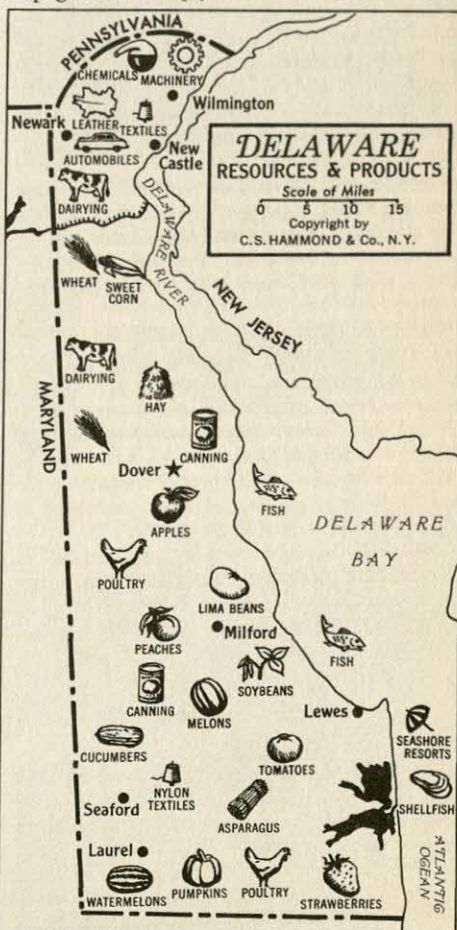
chicken feed is brought in from other states.

There are few minerals. Kaolin, or pottery clay, is found in the extreme northern part of Delaware. Other minerals, also concentrated in the north, are sand, gravel, and building stone.

Commercial fisheries are an important state industry, based on Delaware Bay's rich supply of shellfish and on the ocean's yield of menhaden, herring, ocean perch, and other fish. The marshlands that fringe the bay contain many waterfowl, which attract hunters from neighboring areas.

The state's forest lands amount to 454,000 acres, and the live sawtimber volume is placed at 1,234,000,000 bd. ft., most of which is softwood. The existence of large forests in earlier days helped to establish the state's shipbuilding industry.

Delaware's most valuable resource is its location, which enables it to process and distribute economically resources that originate outside the state itself. For example, the giant refinery at Delaware City, one of the world's largest, can ship gasoline cheaply to three major cities; the



raw material is delivered to it by economical ocean tanker.

DELAWARE'S ECONOMY

At the time of the 1960 census, Delaware had an employed population of 162,950. Of this total, ca. 33 per cent were in manufacturing; 9 per cent in construction; 7 per cent in agriculture, forestry, and fisheries; and 0.4 per cent in mining. The remainder were employed in wholesale and retail trades, in government, and in supplying personal, professional, and other services.

The outstanding manufacturing industry of Delaware is the production of chemicals and allied products, including explosives, plastics, synthetic fabrics, synthetic rubber, dyes, fertilizers, and paints. The chemicals industry in Delaware is particularly associated with the name of E. I. du Pont de Nemours and Co., a firm which began its operations near Wilmington in 1802. The state's value added by manufacture in 1961 totaled \$464,109,000.

There were 5,208 farms in 1959, occupying a total of 763,000 acres. The average farm had 146 acres, with its land and buildings valued at \$34,551.

The most valuable agricultural activity in the state is poultry raising. The sale of broilers normally accounts for about half of all farm marketing receipts, and eggs are also a significant source of income. Other important livestock products are milk and meat animals, including cattle, calves, and hogs. About two-thirds of all farm marketing income is derived from sales of livestock and products.

About one-third of farm marketing derives from crops, including soybeans, corn, potatoes, lima beans, green peas, and tomatoes, from fruits, and from forest, greenhouse, and nursery products. In 1961 total farm marketing receipts amounted to \$105,623,000.

Fisheries are also of commercial importance. In 1959 the fishing catch in Delaware, totaling 284,228,000 lb., was valued at \$3,369,000.

Delaware's mineral output was valued at \$1,053,000 in 1961, comprising less than 1 per cent of the total U.S. value and placing the state 50th among the states. The principal minerals were sand and gravel, stone, clays, and gem stones.

TRANSPORTATION AND COMMUNICATION

Wilmington is an important ocean port; 2,500,000 tons of commerce pass through the city annually. The Chesapeake and Delaware Canal, a sea-level waterway 19 m. long, connects Delaware and Chesapeake bays and is a link in the Intracoastal Waterway from Boston to Miami. The first railroad in Delaware was the New Castle & French Town R.R. (1831), now part of the Penn-

sylvania R.R. Other railroads include the Baltimore & Ohio and the Reading R.R.'s. The railroads operated 292 m. of line in 1959. Delaware had 4,650 m. of municipal and rural roads in 1959, 309 m. of which were unpaved. The principal airports are New Castle County Airport, near Wilmington, and Dover Air Base, which combines military and commercial operations. The state had 12 radio stations and no television stations in 1961. The first paper published in Delaware was the *Wilmington Courier*, issued briefly in 1762. The first paper to be published for any length of time was the *Delaware Gazette*, established in 1785. The largest of the present-day papers are the *Wilmington Journal* and *News*.

POPULATION

Delaware has three counties. The 1960 census population was 446,292 (1962 est. population, 469,000), an increase of 40.3 per cent over 1950. The urban population comprised 292,788, or 65.6 per cent; the rural population 153,504, or 34.4 per cent. Between 1950 and 1960, the urban population rose 47.0 per cent; the rural population, 29.0 per cent. Almost 97 per cent of the urban population and more than 60 per cent of the total population lived in the state's single urbanized area of Wilmington. In 1960 white persons numbered 384,327; of the 61,965 nonwhites, the vast majority (60,688) were Negroes, the remainder including a sprinkling of Indians, Japanese, Chinese, and others. Delaware's native-born residents totaled 431,642; the foreign-born, 14,650. Population density in 1960 averaged 225.6 persons per sq. m.

The major religious bodies are Jewish congregations, The Methodist Church, the Protestant Episcopal Church in the U.S.A., the Roman Catholic Church, and The United Presbyterian Church in the U.S.A.

Chief Cities: Wilmington, in northern Delaware on the Delaware River, is the state's largest city, an ocean port, and the center of the state's industry.

Newark, in the northwestern part of the state, is the second-largest city and the site of the Univ. of Delaware; it has automotive and diversified manufacturing plants.

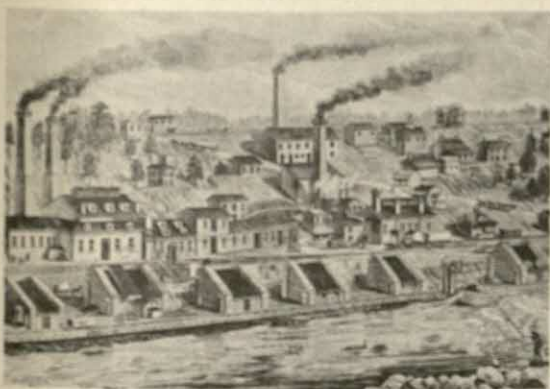
New Castle, on the Delaware River south of Wilmington, a city of many historic sites, manufactures airplane equipment and various metal products.

Dover, the capital city, in central Delaware on the St. Jones River, is a shipping center.

Famous Men and Women: Canby, Henry Seidel (1878-1961), author and editor.

Cannon, Annie Jump (1863-1941), first great woman astronomer.

Dickinson, John (1732-1808), author and states-

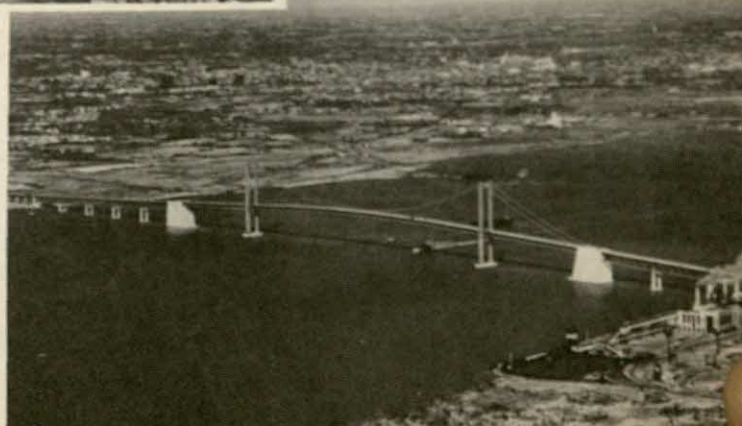


YESTERDAY AND TODAY

The Caesar Rodney Statue (*above*), in Rodney Sq., Wilmington, commemorates a signer of the Declaration of Independence who rode from Dover, Del., to Philadelphia, Pa., in order to break a tie vote on one of America's most decisive documents. The Delaware Memorial Bridge (*below*), which connects Delaware with the New Jersey Turnpike, is one of the world's longest single suspension bridges (*courtesy Delaware State Development Dept.*)

GLIMPSES OF THE PAST

In an annual celebration of "Old Dover Days" (*top left*), horsemen gather on the Green in Dover. Zwaanendael Museum (*center left*), at Lewes, was erected to commemorate the first settlement (1631) in the state (*Delaware State Development Dept.*). A contemporary artist's drawing of the du Pont powder mills in the 1850's (*above*). The mills were situated near Wilmington (*du Pont Photo Library*)



DELAWARE

DELAWARE

man, who was a member of the Continental Congress (1774, 1775) and the Constitutional Convention (1787).

du Pont de Nemours, Éleuthère Irénée (1771-1834), Paris-born founder of U.S. gunpowder factory which grew into the chemical empire that bears his name.

Evans, Oliver (1755-1816), inventor of automatic equipment that revolutionized the milling industry.

Macdonough, Thomas (1783-1825), U.S. naval officer, victor of the battle of Plattsburg in 1814.

Pyle, Howard (1853-1911), author and illustrator.

Rodney, Caesar (1728-84), president of Delaware (1778-82).

Wyeth, Newell C. (1882-1945), painter and illustrator.

EDUCATION

Education is free and compulsory for children between seven and 16 who have not completed the eighth grade. The state's public-school system was established in 1829. Public-school enrollment totaled 91,490 in 1962. There were an additional 16,169 enrolled in Roman Catholic parochial schools throughout the state in 1961. The state-supported institutions of higher learning are the Univ. of Delaware, Newark; and Delaware State Coll., Dover.

Cultural institutions include the du Pont Winterthur Museum at Winterthur, a mansion exhibiting a wealth of early American furniture from 1640 to 1840. Hagley Museum on Brandywine Creek records the early industrial development of the state. At Dover, the Delaware State Museum occupies the Old Presbyterian Church (1790), as well as two other buildings. The State Archives, in the Hall of Records, contain the historical records of the state. In Wilmington, the Delaware Art Center maintains a collection of 19th-century paintings and a special exhibit of the work of Howard Pyle.

GOVERNMENT

Delaware is governed under provisions of a constitution dating from 1897. The constitution gives executive authority to a governor, lieutenant governor, attorney general, and insurance

commissioner, each elected for a term of four years, and to a treasurer and auditor, each elected for a term of two years. The legislature—the general assembly—consists of a 17-member senate, elected every four years, and a 35-member house of representatives, elected every two years. The legislature meets in Dover, the capital, in January of the odd-numbered years, on the first Tuesday. Budget sessions are held in even-numbered years. The judicial system includes a supreme court (with three members, including the chief justice), court of chancery, superior court, orphan's court, court of common pleas for each county, and family and juvenile courts. The judges are appointed for 12-year terms by the governor with the consent of the senate. There are also a municipal court, in Wilmington, and justice-of-the-peace courts. The state is represented in the U.S. Congress by two Senators and one Representative.

HISTORY

Delaware was first sighted by white men when, under a Dutch flag, Henry Hudson sailed up Delaware Bay in 1609. A year later, Sir Samuel Argall paused there on his way to Virginia, naming one of the capes for the governor of that colony, Baron De La Warr; his passage was the basis for the subsequent British claim to the land. The Dutch returned in 1631 to found Zwaanendael (now Lewes), which was wiped out by Indians the following year. In 1638 a group of Swedes built Ft. Christina, at the site of present-day Wilmington. Their colony prospered, and in 1654 they attacked the three-year-old Dutch colony at Ft. Casimir (now New Castle). Their victory was short-lived, as a Dutch force from New Amsterdam (New York) retaliated by capturing Ft. Christina in 1655. Delaware remained Dutch until the British seized it in 1664. The Dutch returned briefly (1673-74), but Delaware was regained by the British and held by the duke of York until 1682, when it was transferred to William Penn, who required it for the defense of his newly acquired Province of Pennsylvania. The Three Lower Counties of Delaware, as they were called, were initially governed by the same governor and assembly as Pennsylvania, but they were granted a new charter in 1701. In 1704 Dela-

MAJOR RECREATIONAL AND HISTORIC FEATURES

Name and Type	Size and Location	Points of Interest
Brandywine Springs State Park (established 1951)	59 acres, 4 m. W. of Wilmington (U.S. 13)	Site of a famous 19th-century resort
State Lands Recreation Area (established 1940)	2,600 acres, near Rehoboth (state 14)	Beach and dunes maintained in natural state; bathing, boating, and fishing
Ft. Christina State Park (established 1938)	2 acres, near Wilmington (U.S. 13, 13A; state 9)	Carl Milles monument, gift of Swedish people to people of U.S. in 1938 on 300th anniversary of Swedish settlers' landing; Holy Trinity (Old Swedes) Church nearby
Trap Pond State Park (established 1951)	927 acres, near Laurel (U.S. 13, 13A; state 24)	Interesting flora and fauna, including bald cypress trees at the northern limit of the species

DELAWARE

ware's separate assembly met for the first time at New Castle. Delaware remained semiautonomous until 1776, when it declared itself completely independent.

When independence was being debated in the second Continental Congress (1776), Delaware's delegation was divided. Caesar Rodney, at home on militia business, raced back from Dover to break the tie and cast the state's ballot for the Declaration of Independence. The Delaware Continentals distinguished themselves throughout the Revolution. Tradition says that they were nicknamed "Blue Hen's Chickens," after the battle of Long Island, from the fighting cocks a company had brought to camp. Some historians believe that the Stars and Stripes first flew in battle in Delaware, at Cooch's Bridge on Sept. 3, 1777. On Dec. 7, 1787, the state became the first to ratify the Constitution of the U.S.

The state's constitution of 1776 opposed slavery, and in 1787 it became illegal to import slaves. The number of free Negroes increased, and the number of slaves decreased. Residents of Delaware were sympathetic to the slaves and generally favored manumission, but they were not abolitionist. In the Civil War the state remained in the Union, but pro-Southern sentiment was strong, and many Delaware men enlisted in the Confederate armed forces. The state first rejected the 13th, 14th, and 15th Amendments and did not ratify them until 1901.

Delaware furnished 9,213 men and women to the armed forces in World War I and 34,149 in World War II. The state's industries made an immense contribution to the war effort, ranging from ships and high explosives to foodstuffs and nylon. Since then Delaware's economy has con-



Courtesy Delaware State Archives, Dover, Del.

LANDING OF THE SWEDES, 1638

The *Kalmar Nyckel* at anchor off "The Rocks," on the site of present-day Wilmington, Del.

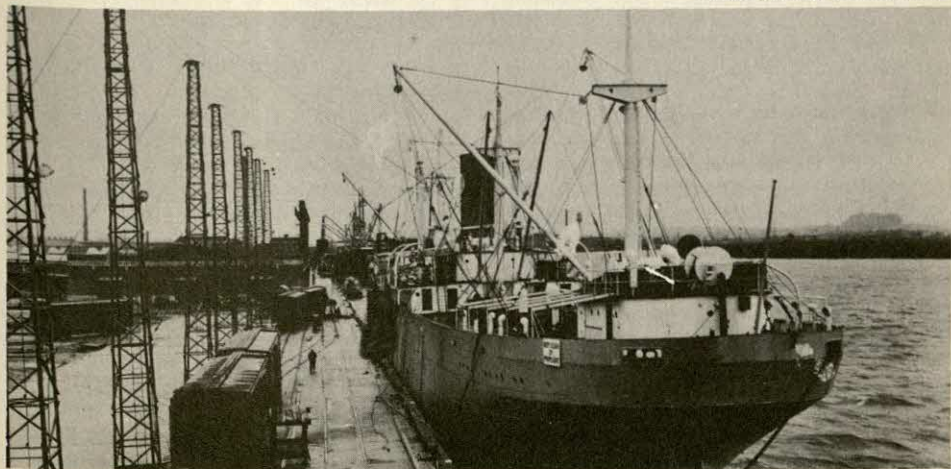
tinued to grow, both industrially and agriculturally, and the state continues to benefit from its location, which makes it a transportation and communications center.

See also separate entries on most of the individuals and geographical and historical subjects mentioned in this article.

Delaware, a city in central Ohio, seat of Delaware County, 23 m. N. of Columbus, on the Olentangy River, served by the Chesapeake & Ohio, New York Central, and Pennsylvania (freight) R.R.'s. It is in an agricultural and stock-raising area, and limestone quarries are nearby. Its manufactures include wood and rubber products, stoves, and screws. In 1958 it had a value added by manufacture of \$11,896,000. Delaware is the birthplace of President Rutherford B. Hayes and the seat of Ohio Wesleyan Univ. Laid out in 1802, Delaware was incorporated in 1815 and made a city in 1903. Population, 1940, 8,944; in 1960, 13,282.

HARBOR OF WILMINGTON, DELAWARE

Courtesy Ewing Galloway, N. Y.



Delaware, UNIVERSITY OF, a coeducational, land-grant, state institution of higher learning at Newark, Del., founded in 1833. It comprises the schools of arts and science, agriculture, education, engineering, home economics, and graduate studies; an agricultural experiment station; and an extension service. The library, which contains a noted diary collection and the Hazlitt papers, has some 250,000 volumes. Annual student enrollment totals ca. 6,000, and there are 225 members of the faculty. The physical plant is valued at \$20,000,000.

Delaware Bay, an inlet of the Atlantic Ocean, separating Delaware from New Jersey. It is about 50 m. long and 27 m. wide and is important as an avenue of commerce. Besides receiving the waters of the Delaware River, it receives the inflow of the Maurice and other streams. The north end of the bay, at the mouth of the Delaware River, is ca. 4 m. wide; its entrance, at the southeastern end between Cape May, N.J., and Cape Henlopen, Del., is ca. 12 m. wide.

Delaware Indians, a confederacy of Algonkian-speaking tribes who called themselves Leni-Lenape. At the time of white settlement they occupied a large area in southern New York, eastern Pennsylvania, and Delaware. The most notable event in their history took place in 1682, when they had their first council with William Penn at what is now Germantown, Philadelphia. Their great chief Tammany (or Tamenand), from whom the Tammany Society (*q.v.*) took its name, belongs to this period. In about 1720 the Iroquois assumed dominion over them, and they were gradually crowded west by white colonists. On reaching the Ohio country, they became independent of the Iroquois, and, in the subsequent wars leading up to the treaty of Greenville in 1795, they showed themselves the most determined opponents of the advancing whites. During the 17th and 18th centuries, many were converted to Christianity by Moravian missionaries. From Ohio they moved to Indiana, Missouri, and finally to Kansas, Oklahoma, and Texas. Three bands worked northward into Ontario. In 1867 one group incorporated with the Cherokee in Oklahoma, and another band later affiliated with the Caddo and Wichitas. There are now about 900 of the Delawares, but only 20 percent of them can be considered of full blood.

Delaware Prophet, a North American Indian leader of the 1760's, whose real name is unknown. About 1762 he began to exhort the Delaware Indians of Ohio to abandon intertribal warfare, intoxication, polygamy, and magical practices and promised that if the Indians would follow his teachings they would be able to resist the white man. After the failure of Pontiac's re-

billion (1763-66), the Delaware Prophet's following dwindled and the Indians turned to other leaders.

Delaware Water Gap, a borough and summer resort in Monroe County, Pennsylvania, on the Delaware River, 85 m. n. of Philadelphia. The borough is 2 m. n.w. of a scenic gorge, also called the Delaware Water Gap, in the Kittatinny Range of the Appalachian Mts. The Delaware River flows through the 2-m.-long gap between Mt. Tammany, N.J., and Mt. Minsi, Pa. (both about 1,500 ft. high), at a river elevation of 300 ft. Population, 1950, 734.

De La Warr (*dě'l'a-wēr*) OF DELAWARE, THOMAS WEST, BARON; the first colonial governor of Virginia, born in Hampshire, England; July 9, 1577; died at sea, June 7, 1618. Educated at Oxford Univ., he went to Parliament in 1597 and later fought in Holland and, in 1599, in Ireland under Robert, 2nd Earl of Essex. He joined the Virginia Co. in 1609 and was made governor and captain general of Virginia for life in 1609 or 1610. He governed the colony in 1610, built Fts. Henry and Charles, and rebuilt Jamestown (*q.v.*). He then returned to England to enlist aid for the colony, remaining there until 1618, when he was petitioned to rejoin the colony. He died on the return voyage. The state of Delaware and Delaware Bay were named for him.

Delbrück (*dě'l'brūk*), HANS, historian, born in Bergen, Prussia, Nov. 11, 1848; died in Berlin, July 14, 1929. He studied at Heidelberg and Bonn and served in the Franco-Prussian War. He was tutor (1874-79) to Prince Waldemar of Prussia, was elected to the Prussian diet in 1882, and served (1884-90) in the Reichstag. Professor of modern history (1885 *et seq.*) at the Univ. of Berlin, he wrote several works on the history of the art of war and, among others, a history of the world. He also was editor (1883-1919) of the *Preussische Jahrbücher*.

Delcassé (*dě'l-kā-sā*'), THÉOPHILE, statesman, born in Pamiers, France, March 1, 1852; died in Nice, Feb. 22, 1923. He studied in Toulouse and later became a member of the chamber of deputies and undersecretary (1893-95), then minister, for colonies. From 1898 to 1905 he was foreign minister. He represented France in the dispute with Great Britain over the Fashoda (*q.v.*) incident (1898-99) and concluded a treaty with Great Britain, in 1904, which prepared the way for the Entente Cordiale (*q.v.*) to offset Germany's design to hold France in a minor political role. A year later, he was forced to resign because of Franco-German differences in Morocco. He later joined other cabinets, but one of his most important posts was that of ambassador to the Russian court (1913-14) on the eve of World War I.

DELEDDA

He was again foreign minister (1914-15) but then retired from public life.

Deledda (*dā-lēd'dā*), GRAZIA, writer, born in



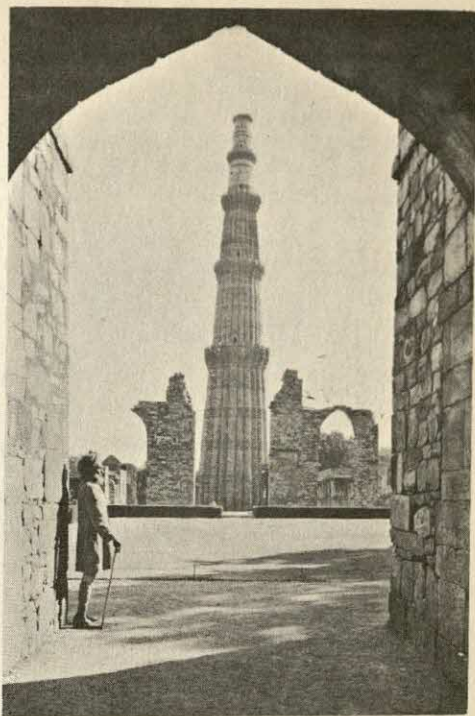
Courtesy Brown Bros., N. Y.

GRAZIA DELEDDA

Nuoro, Sardinia, Italy, in 1875; died in 1936. An outstanding Italian novelist, she is noted for her portrayals of Sardinian peasants. A member of the Italian Acad. of Immortals, she won the Nobel Prize for Literature in 1926. Her numerous works include: "The Mother," "Marianna Sirca," "The Old Man of the Mountain."

Delft (*dēlft*), a city of Holland, on the Schie River, about 6 m. s.e. of The Hague. It is important as a commercial center, being situated on a number of railways and intersected by numerous canals. A Gothic church, called the Oude Kerk, dates from the 15th century. Another Gothic church, the Nieuwe Kerk, has a tower 375 ft. high and contains 500 bells. William I of Orange was assassinated in the Prinsenhof, which now serves as a museum. Among the educational institutions is a polytechnical school. The manufactures include delftware, a celebrated kind of earthenware, carpets, ammunition, soap, and cotton and woolen goods. Population, *ca.* 55,000.

Delhi (*dēl'hī*), ancient capital of India, in Delhi province on the Jumna River, about 830 m. n.w. of Calcutta. Solid stone walls secure three sides, through which entrance to the city is effected by 10 gates, the other side being protected by the waterfront. The site of the city is on a high eminence. It has important railroad connections with the principal commercial centers of India and southern Asia. The former extent of this metropolis is marked by vast ruins of gardens, pavilions, palaces, and mausoleums. Among the noteworthy buildings is the Shah Jehan fort and palace, commenced in 1639, located in the eastern



Courtesy Canadian Pacific Steamships

DELHI. THE TOWER OF KUTB MINAR

part of the city. It is 3,200 ft. long and 1,600 ft. wide. Its carvings and decorations are among the finest in the world. The Great Mosque, or Jama Masjid, after the Byzantine-Arabic style, was erected in the 17th century by Emperor Shah Jehan. Eleven m. s. of the city is the Kutb Minar, built in the 13th century, a tower 48 ft. in diameter at the bottom and 10 ft. at the top, with a height of 240 ft. Numerous inscriptions from the Koran adorn the walls. The city has been improved greatly within recent decades. Its bazaars are famous for trading in fabrics, precious stones, and gold and silver work. A public school system is maintained. Delhi Univ. constitutes a center of higher learning. It has a number of Protestant churches, government buildings, and numerous places of worship.

Delhi was formerly the largest city of Hindustan and has been successively the capital of Hindu, Afghan, Mogul, and British rulers. In 1803 it was the seat of fighting during the Sepoy mutiny of 1857. More than one-half of the population is Hindu. Population, 1922, 239,468; in 1941, 521,849. See also *New Delhi*.

Delibes (*dē-lēb'*), CLÉMENT PHILIBERT LEO, composer, born at St.-Germain du Val, Sarthe, France, 1836; died in 1891. He was a success at the age of 19, when his first operetta, "Deux Sacs de Charbon," was produced. His works for the stage include "Le Roi l'a dit" (1873), a comic



LÉO DELIBES

opera, and "Lakmé" (1883), an opera with a rich melodious score in the Romantic tradition. He wrote several ballets, best-known of which are: "Coppélia" (1870), and "Sylvia" (1876), which, next to "Lakmé," contains the ballet music on which his fame rests.

Delirium Tremens (*dē-lī'r'i-ūm trē'menz*), an acute episode of chronic alcoholism. Delirium tremens may be provoked by excessive periodic drinking; or, in a habitual drinker, the episode may be precipitated by another disease. A serious injury may also trigger an attack. The patient is seized with a violent, noisy, terror-filled mental disturbance, accompanied by visual hallucinations of frightening and disgusting creatures. Extreme restlessness, insomnia, and marked tremors of the hands or tongue are characteristic of an attack.

Careful nursing, gradual introduction of food, sedation, and large doses of vitamins, particularly of Vitamin B compound, are indicated. Medical opinion varies on the advisability of continuing with small amounts of alcohol during treatment, some physicians recommending sudden withdrawal.

Delius (*dē'li-ūs*), FREDERICK, composer, born in Bradford, Yorkshire, England, in 1862; died in 1934. Of German parentage, he taught himself composition in Florida (1883-86), thereafter attending Leipzig Conservatory (1886-88). His compositions are distinguished for their integrated and original harmonic structure. In a sensitive, descriptive way, he attempts to reflect the moods of nature in his compositions.

In addition to many orchestral works, concerti, songs, and chamber music, he wrote the operas "Koanga" (1904), "A Village Romeo and



FREDERICK DELIUS

Juliet" (1907), and "Fennimore" (1914). Particularly well known are his choral works with orchestra: "A Mass of Life," "Appalachia," "Sea-drift," and "Over the Hills and Far Away."

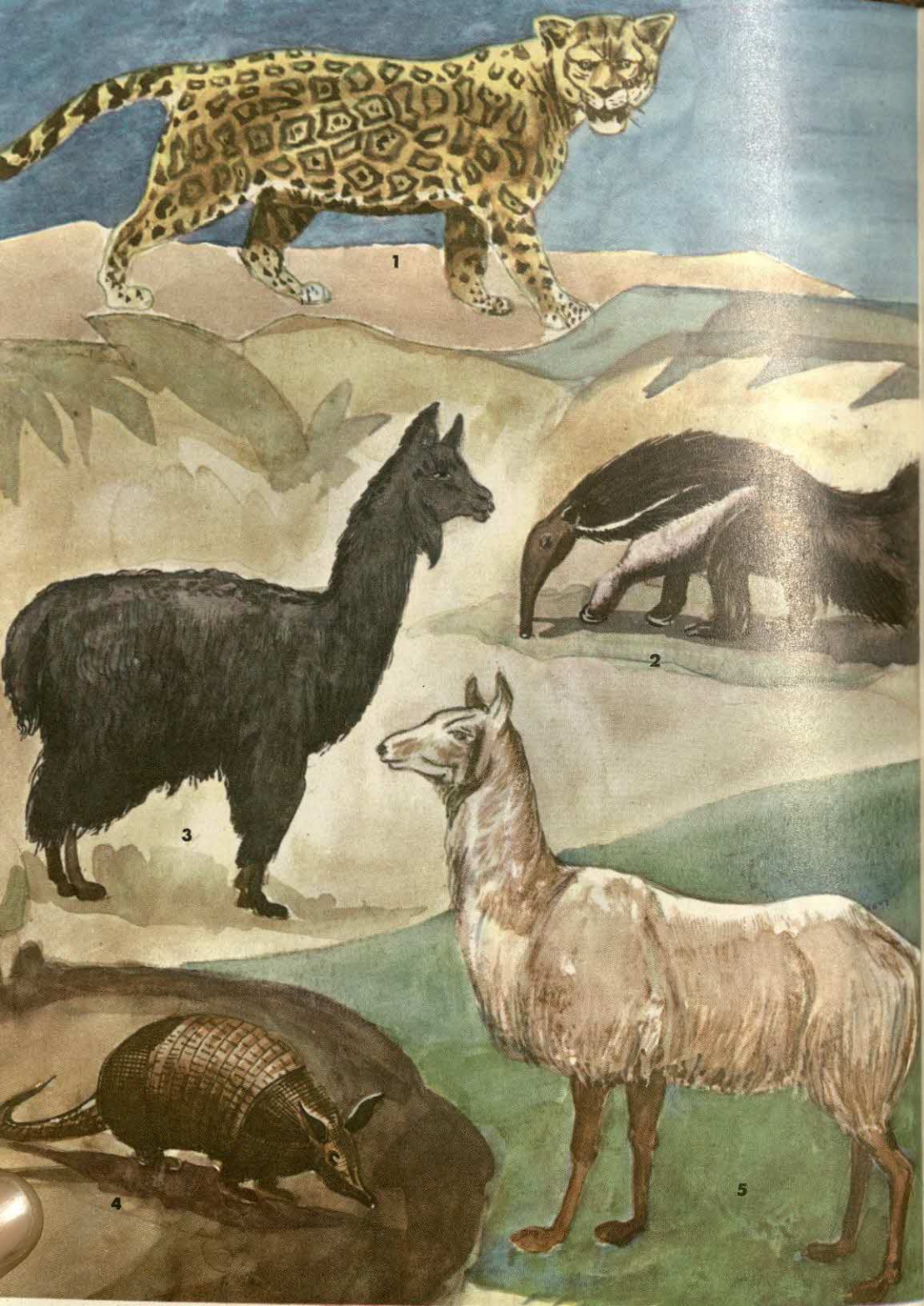
Della Chiesa (*dē'llā kē-ā'sā*), VIVIAN, singer, born in Chicago, Ill., 1915. After studying at the Chicago Musical Coll., she won a contest conducted by Radio Station WBBM in Chicago (1935), as the result of which she made several appearances on that station during the following year. She made her operatic debut at the Chicago City Opera a year later in the leading role in "La Bohème," and was acclaimed as an artist. As an opera star, she has performed with the St. Louis Opera, the Cincinnati Zoo Opera, and the San Francisco Opera. Known as a concert and radio star, she was one of the soloists chosen to appear with the NBC Symphony during the time when Toscanini was its conductor.

De Long (*dē lōng'*), GEORGE WASHINGTON, explorer, born in New York City, Aug. 22, 1844; died in Siberia, Asia, Oct. 30, 1881. After securing an education in the public schools of Brooklyn, he was appointed midshipman in 1861, and in 1865 was graduated from the U.S. Naval Acad. He became master in 1868, and was promoted to the rank of lieutenant commander in 1879. James Gordon Bennett purchased and fitted out the *Jeannette* for a polar exploration in 1879, equipping it for a three years' Arctic voyage. De Long became commander of this vessel and sailed from San Francisco, July 8, 1879, by way of Bering Strait, in search of the North Pole. After cruising through the Polar seas, the vessel was crushed by ice and sunk on June 13, 1881. In October of the same year De Long with some of his party



MAMMALS OF NORTH AMERICA

1. Grizzly Bear (*Ursus horribilis*) Western N.A. 2. Big Horn Sheep (*Ovis canadensis*) Western U.S. 3. American Elk or Wapiti (*Cervus canadensis*) Rocky Mt. region 4. American Moose (*Alces americanus*) Canada and Northern U.S. 5. Mountain Lion or Cougar (*Felis concolor*) Western N.A., Canada to Patagonia



MAMMALS OF SOUTH AMERICA

1. Jaguar (*Felis onca*) Texas to Patagonia, Paraguay 2. Giant Anteater (*Myrmecophaga jubata*) S. and C. America 3. Alpaca (*Lama huanaco* var. *paca*) Andes Mts. of Chile, Peru, and Bolivia 4. Nine-Banded Armadillo (*Dasypus novemcinctus*) Tropical and Temperate S.A. 5. Llama (*Lama huanacus glama*) S. Peru

perished on the banks of the Lena River, in Siberia.

Delos (*dē'lōs*), the smallest island of the Cyclades, in the Grecian Archipelago, with an area of about 12 sq. m. The surface is a rugged mass of granite, and near its center the rocky peak of Mt. Cynthus rises to a height of 350 ft. above sea level. The island is celebrated in the song, myth, and history of Greece. Myths make it the scene of the birth of Apollo and Artemis, and, though once a floating mass, it was fixed to the bottom of the sea by Zeus that it might become celebrated by the birth of these noted personages. It was the scene of a festival to Apollo, at which the Greeks from many nations gathered. In 477 B.C. the Confederacy of Delos was formed with Athens at its head, the name being derived from the meeting of its deputies at the Temple of Apollo, in which the treasures of the confederation were stored. Delos became a commercial center after the fall of Corinth in 146 B.C., and was famed for its favorite markets and fine harbors. Excellent palm groves grew in its public places, and brazen vessels abounded in vast numbers. In the year 87 B.C. it was laid waste by the Mithridatic War. At present brushwood is quite common and small fields of corn are cultivated by the natives.

Delphi (*dē'l'fī*), a celebrated town of ancient Greece, in the territory of Phocis, noted principally on account of the most important temple and oracle of Apollo. Its location was about 6 m. from the Corinthian Gulf, hemmed in on the north by the wall-like cliffs of Mt. Parnassus, on the south by Mt. Cirphis, and on the east by smaller ridges. The Plistus flowed from east to west and drained the region of its surplus waters. The site of the ancient town is occupied at present by the village of Castri. The main point of interest still remains distinguishable, though it was somewhat altered by an earthquake in 1870.

Delphi was noted as the meeting place of the Amphictyonic Council and near it the Pythian games were held. The celebrated oracles were delivered by a priestess, who occupied a tripod over an opening in the ground, from which came intoxicating vapors accompanied by the inspiration of the Delphian god. The replies that came from the oracle were quite obscure and dual in meaning, but served in the regulation and support of the political, civil, and religious autonomy of the Greeks. These oracles grew in fame from the 9th century B.C. until they were abolished, long after the Christian era, by Emperor Theodosius. The Temple of Apollo was destroyed, but rebuilt, and added to at various times. The last structure was built in the 5th century B.C., which was the most beautiful and magnificent, costing 300 talents, about \$575,000. In it were statues by the great sculptors of Greece, and it was decorated by paintings of the foremost masters of the Gre-

cian art. In the times of Pliny, Delphi contained more than 3,000 statues, and a golden statue of Apollo stood within the temple. It was plundered at various times, but principally by Nero and Constantine.

Delphos (*dē'l'fōs*), a city in Allen County, Ohio, 15 m. N.W. of Lima, on the Pennsylvania, the Akron, Canton & Youngstown, and other railroads. The city, which owns its own waterworks, has quarries, and is surrounded by a farming section. Petroleum is obtained in the vicinity. The manufactures include lumber products, machinery, and farming implements. The first settlement on its site was made in 1834, and it was incorporated in 1851. Population, 1900, 4,517; in 1930, 5,672; in 1940, 5,746; in 1950, 6,220.

Delsarte (*dēl-särt'*), FRANÇOIS ALEXANDRE, teacher of elocution, born in Solesmes, France, Dec. 19, 1811; died July 19, 1871. His early study was for the stage, but he devoted himself to instruction in elocution on account of a failure of his voice. He studied to found and elaborate a system by which to reduce human expression to a science. After years of careful application he perfected his system of physical culture, known as the Delsarte System. Singular success made him the center of a school and caused him to be the recipient of many honors.

Delsarte System, the name applied to a method of general physical culture once highly popular in both America and Europe. It was adopted in the schools of many cities, in colleges, and in private institutions, and was largely employed in regular courses of instruction. The originator, François A. Delsarte, asserted that every outward manifestation is the expression of an inner state. He classed the head as the *mental* organ, the trunk as the *emotional* organ, and the limbs as the *primary vital* organs. The mental movements proceed toward the center, the normal around the center, and the vital from the center. In general the laws of force, rhythm, direction, reaction, succession, velocity, and opposition should govern bodily movements. The influence of systematic application was held efficient in developing the high quality of orators, dramatists, and elocutionists, giving them a fine quality of vocal utterance, gesture, and expression in accordance with the higher art of elocution. It was thought to have a good effect on physical development.

Delta (*dēl'tā*), the name of the Greek letter which corresponds to the letter D. The term was applied to the deposits of silt at the mouth of the Nile, on account of its resemblance to that letter. Since then the same name has been given to the alluvial tracts deposited by many of the great rivers, the waters of which flow into the sea by two or more branches. Deltas occur only where the mouth of a river is sheltered from the ocean

and the tides and oceanic currents are weak, or in inland lakes and seas where the movements of tides and ocean currents are entirely absent. The delta of the Mississippi is the largest in America. It has an area of 12,300 sq. m., two-thirds of which is permanently above water, while the remaining portion is a sea marsh. It begins a short distance south of the confluence of the Red River and extends far into the Gulf of Mexico. The delta of the Nile, which has its outlet into the Mediterranean, has an area of about 9,000 sq. m., and is enlarging continually by the sediments deposited annually, which are carried from inundated regions. The delta of the Ganges and the Brahmaputra, in the Bay of Bengal, exceeds the size of the delta of the Nile. Countless islands have been formed by the deposits and numerous streams wind their way among them in various directions. Among the most important deltas in Europe are those of the Po, Rhone, and Rhine; in Africa, those of the Nile, Zambezi, and Senegal; in Asia, those of the Ganges, Brahmaputra, Euphrates, Indus, Yang-tse, and Hoang-ho.

Deluge (*dē'lūj*), a flood or torrent of water, lava, fire, or melted stone. The name is applied in particular to the flood mentioned in Genesis 6:9. This remarkable flood was predicted by Noah and is generally credited to the year 2348 B.C. Various stories of vast floods have been handed down from remote antiquity by various races. In the Hindu story the god Vishnu is represented as giving warning to Prince Satyavarata of an approaching flood, and a vessel was furnished to him in which he and a number of others were saved. The person told of in the Chaldean history as surviving a flood is Xisuthros, who was carried by a ship over a deluge which is said to have lasted seven days, and he, like Noah, is said to have sent birds out for the purpose of ascertaining whether the flood had subsided.

Delusion (*dē-lū'zhūn*), a wrong conception, originating either in ignorance or in false conclusions, or even in mental disease.

Demand and Supply (*dē-mānd' and sū'plī*), In political economy *demand* signifies the quantity of an article people are ready to purchase in the market at a specified price; *supply* conversely denotes the quantity of an article offered to purchasers in the market at a certain price. The difference between the two economic forces tends to influence greatly the prices of goods; if the demand exceeds the supply, prices usually go up; if the supply is greater than the demand, prices invariably go down.

Demarcation (*dē-mār-kā'shūn*), LINE OF, an imaginary boundary line fixed by a bull of Pope Alexander VI in 1493. Defining the Spanish and Portuguese possessions in the New World, it ran 100 leagues (one league equals about 3 m.) west of the Azores from north to south. All land dis-

covered west of this line was declared Spanish while the territory discovered east of it was allotted to Portugal.

Dementia Precox (*dē-mēn'shi-à prē'ēōks*). See *Psychiatry*.

Demetrius (*dē-mē'trī-ūs*) I, called Poliorcetes, King of Macedonia, born about 338 B.C.; died in 283 B.C. He was a son of Antigonos, King of Asia, and fought with his father against Ptolemy of Egypt in Syria. In 307 B.C. he captured Athens from Cassander, and soon after defeated Ptolemy in a naval battle near Cyprus. In 305 B.C. he laid siege to Rhodes, but failed to take the city, and four years later he was defeated at the Battle of Ipsus in Phrygia, causing him to lose his possessions in Greece. He seized the throne of Macedonia in 294 B.C., but was driven out by Pyrrhus and subsequently surrendered to Seleucus, who kept him a prisoner the remainder of his life.

De Mille (*dē-mil'*), AGNES (GEORGE), choreographer and dancer, born in New York, N.Y., the daughter of film producer William De Mille. She studied English at the Univ. of California, but after being graduated took up the study of ballet. She first appeared as a dancer in a New York production in 1927 and made her concert debut the following year. She received widespread attention when she did the choreography for a melodrama, "The Black Crook," in 1929, and was soon creating dances for her own appearances and for Broad-

AGNES DE MILLE IN "RODEO"

Photo by M. Seymour, Chicago



way shows. She joined the newly organized Ballet Theater as dancer and choreographer in 1939. Among her most famous single dance works are "Rodeo" (1942) and "Fall River Legend" (1948). She choreographed many entire Broadway shows, including "Oklahoma" (1943), "One Touch of Venus" (1943), "Bloomer Girl" (1944), "Carousel" (1945), "Brigadoon" (1947), and "Paint Your Wagon" (1951). Two volumes of autobiography are "Dance to the Piper" (1952) and "And Promenade Home" (1958).

De Mille, CECIL BLOUNT, motion-picture producer and actor, born in Ashfield, Mass., Aug.



Courtesy CBS

CECIL B. DE MILLE

12, 1881; died in Hollywood, Calif., Jan. 21, 1959. Educated at the Pennsylvania Military Acad. and the American Acad. of Dramatic Arts, New York City, he began his career as an actor and playwright. In 1913 he formed The Jesse L. Lasky Feature Play Co. with Lasky and Samuel Goldwyn; the same year he produced his first film, "The Squaw Man." Producing more than 70 motion pictures, he was famous for his biblical spectacles, such as "The Ten Commandments" (1923; 1956), "King of Kings" (1927), "Sign of the Cross" (1932), "Cleopatra" (1934), "The Crusades" (1934), and "Samson and Delilah" (1949). He also filmed epics of American life, including "The Plainsman" (1936), "Northwest Mounted Police" (1940), "Union Pacific" (1939), "Reap the Wild Wind" (1942), "The Buccaneer" (1947; 1958), and "The Greatest Show On Earth" (1953), which won him his first Academy Award. Active in radio, he was host of "Lux Radio Theatre" (1936-45).

Democracy (*dê-môk'rà-sy*), from the Greek, meaning the rule of the people, as opposed to monarchy and aristocracy; an ancient Greek conception of government whereby the people direct

the activities of the state, either directly or through representatives. Athenian democracy reached its height under Pericles, in the 5th century B.C. One hundred and fifty years later, Plato and Aristotle rejected democracy as practiced. Today democracy represents "government of the people, by the people, for the people," opposing totalitarian or authoritarian rule of a single party or a government without parliamentary control.

Democratic Party (*dēm-ô-krăt'ik*), one of the most important political parties of America, having been in continual existence since about 1800. The rise of such a party in the nation under the new Constitution was natural. In the minds of most Americans the love of individual liberty was native, rather than the desire for a strong central government. Those who felt this need most strongly were naturally quite likely to look with apprehension upon the possibility of its being encroached upon by the Federal government. For this reason they advocated a strict construction of the Constitution and states' rights. These elements of political thought drew the Anti-Federalists together in 1788, and party feeling was further extended by the strong sympathy of many Americans with the French revolution. The view that the government should extend aid to France in its contest with England greatly quickened the public pulse. Thomas Jefferson put himself at the head of the party drawn together by agreement in these views and led the opposition to the Federalists. The party became known as the Democratic-Republican. Its members were commonly called Republicans until 1828 when, under Jackson's administration, the name Democrat came into use.

The party was in opposition to the administration from its origin in 1792 to 1801, and from the first was strongest in the Southern states. With the election of Jefferson in 1800 it came into power. Among the chief tenets of the party were belief in freedom of speech, of the press, of religion, of politics; in economical government, popular rule, hospitality to immigrants, and the avoidance of foreign complications. The Federalist party went out of existence after the War of 1812 and the Democratic party came into the chief possession of the field. Later questions regarding commercial revenues, free trade, national banks, and other nationalizing measures divided the party and caused the organization of the Whigs. In 1829 Andrew Jackson led a new element into the party and gave to it the popular character. From this time it won every Presidential election but two until 1860, when it was divided regarding the slavery question. The Southern leaders advocated slavery, while the Northern portion favored preserving the Union, thus making it possible for the newly organized Republican party to elect its President.

The split of the Democratic party before the Civil War sent it into sharp decline. The newly formed Republican party, aided by a firm and unified following, won the support of Northern business interests, and the enfranchised Northern Negroes. On the opposite side of the picture was the solid Democratic front that was established in the South.

In the period following the Civil War, the Democrats found themselves in the position of a minority party, beset by internal difficulties and out of favor with the voters. The issue of free silver once more split their ranks in 1896, postponing the party's looked-for recovery. Vice President Andrew Johnson, who succeeded Lincoln to the Presidency after the latter's death, was a member of this party. The only other Democratic Presidents between the Civil War and the inauguration of Franklin D. Roosevelt were Grover Cleveland (1885-89 and 1893-97) and Woodrow Wilson (1913-21).

In the campaign of 1928, however, Democrat Alfred Smith polled the largest vote ever obtained by the party. This reborn popularity finally bore fruit in 1932 when, partly as a reaction against the depression that began in 1929, Franklin Delano Roosevelt was elected to the Presidency by a large majority. In 1940, he established a precedent in U.S. politics by being elected to the office for a third term, and, in 1944, for a fourth term.

With the end of World War II voters elected a Republican majority to congress in 1946. In 1948, however, President Harry S. Truman, who had succeeded to the Presidency in 1945 upon the death of Roosevelt, was re-elected by a large majority of the electoral votes. In 1952 and 1956 the Democratic nominee, Adlai E. Stevenson, lost to the Republican nominee, Dwight D. Eisenhower, the popular allied commander during the war. In 1954 the Democrats regained control of Congress, and in 1960 John F. Kennedy, Democrat, defeated Richard M. Nixon, Republican.

Presidents elected by the party, or holding Democratic views, are Thomas Jefferson, James Madison, James Monroe, John Quincy Adams, Andrew Jackson, Martin Van Buren, James K. Polk, Franklin Pierce, James Buchanan, Grover Cleveland, W. Wilson, F. D. Roosevelt, H. S. Truman, J. F. Kennedy, and L. B. Johnson.

Democritus (*dê-môe'ri-tūs*), Greek philosopher, born in Thrace about 460 B.C.; died about 361. Little is known of his life, though it is certain that he was the most learned thinker of his age. His style was praised by Cicero and imitated by Pyrrho. He advocated the mechanical or atomical theory of Leucippus, his teacher. He assumed that particles or atoms constitute the elementary ground of nature, and that these are indivisible and in eternal motion. While he admitted the presence of law in nature, he did not

acknowledge that of design.

The philosophy of Democritus represents the first attempt at a theory of materialism (*q.v.*) because it does not acknowledge any purpose behind the spiritual laws. Mind is explained by him as consisting of the finest atoms, while matter is created by heavier and denser atoms. The atoms of matter emanate reflections (*eidola*) which impress the atoms of mind. This concept is certainly materialistic in a primitive sense, but his idea of atoms in continuous motion approaches the concept of modern natural science.

His philosophy has been accepted by many of the ancient writers, most important of them Lucretius (*q.v.*). It was through the writings of Lucretius that the ideas of Democritus captured the imagination of the philosophers of the Renaissance. Democritus' materialism parallels the re-discovery of nature in the Renaissance.

Demon (*dē'mūn*), a name applied anciently to a spirit or immaterial being of supernatural powers, supposed to hold a middle place between men and the celestial deities. The ancient Greeks regarded demons in the same way as Christians look upon angels, but the name is now applied to an evil spirit or a fiend. Evil spirits are termed demons in the New Testament, but in making translations the name has come to be displaced by the word *devil*. *Demonology*, that branch of the science of religion which relates to demons, is obscured in the treatises of old writers in that the sources of information are related wholly to the civilized nations, instead of at least in part to the primitive and barbarous tribes. Ideas of demons still prevail to some extent even in civilized life, as is evident by the so-called spirit manifestations of modern times.

Demosthenes (*dê-mō'sthē-nēs*), orator and statesman of ancient Greece, born about 384 B.C.; died by his own hand in 322. His life story is well known from contemporary records. He was the son of a wealthy Athenian sword-maker, who died early, leaving the care of his children and fortune to three guardians, who, however, abused their trust. At the age of 17 Demosthenes conducted a suit against them himself and won it, though much of his wealth had been lost. He was nervous, had an impediment in his speech, a tuneless and harsh voice, and ungraceful action. To overcome these defects he took great pains. He cultivated his voice by reciting on the shores of the sea amid the roar of waves. He improved his gestures by studying effects before a mirror. He early resolved to master the law and politics of Athens, and he labored toward that end with enormous perseverance. For some time he busied himself as a speech writer, and thus obtained sufficient means to devote the remainder of his life to politics.

His reputation as an orator is based on the



DEMOSTHENES

highly pleasing presentation of his speeches as recorded by his contemporaries, and by the importance of their contents. Demosthenes discussed political subjects—both internal Athenian politics and foreign affairs—and matters of public law. The domestic reforms for which Demosthenes fought were also intended to improve Athenian foreign relations.

Demosthenes made his first public appearance ca. 355 B.C., from which time until his death the history of Athens is largely linked with the story of his own life. He never changed the guiding principle of his political ideas: the fight for an increasing unification of Greece under the leadership of Athens, in order to resist more effectively Macedonian aggression. The weakness of the Greek states had led Philip of Macedon to encroach upon their common liberties. Demosthenes spent the first 10 years of his public life in warning his countrymen against the dangers of division and urging them to unite their forces. Of his celebrated speeches, those known as the *Olynthiacs* were delivered when Philip attacked the state of Olynthus, and these were followed by his great *Philippics* against Philip himself. Three of these *Philippics* were delivered from 351 to 341 (the fourth is thought to be forged). He witnessed the Battle of Chaeronea, in which the Athenians and Boeotians were defeated and Greek liberty was crushed. He next tried to cause

DEMPSEY

a general rising against the Macedonians, but his countrymen were slow in heeding his warnings, and were soon obliged to sue for peace.

Demosthenes escaped with difficulty from falling into the hands of the conqueror. His famous oration, "On the Crown," delivered in 330, was a defense of his whole political life. He was imprisoned in 324 on a charge of having received a bribe from one of Alexander's generals and was condemned, but found safety by escaping into exile. It is thought that the charge was unfounded and instigated by his political enemies, led by Aeschines (*q.v.*). Shortly after the death of Alexander Demosthenes was recalled to lead an attempt to secure freedom from the Macedonians, but the army of Athens was crushed in the Battle of Crannon by Antipater. Antipater asked for the condemnation of prominent Athenian statesmen, among them Demosthenes. In order to avoid a siege of Athens by Antipater, the Athenians yielded, and Demosthenes fled for safety to the Temple of Poseidon, in the island of Calauria, but poisoned himself to escape arrest.

Demosthenes' oratory ranks as high in literary value as the poetry of Homer. His prose represents a highly individual style based equally on successive logical developments and on highly artistic construction.

Dempsey (*děmp'sy*), WILLIAM HARRISON

JACK DEMPSEY

Courtesy Brown Bros., N. Y.



("JACK"), boxing champion, born at Manassa, Colo., June 24, 1895. Engaged in mining as a youth, he became a professional boxer at 18. He became world heavyweight champion by defeating Jess Willard at Toledo (1919). Defending his title successfully in bouts with Georges Carpentier (1921), and with Luis Firpo (1923), he lost it to Gene Tunney (1926). Failing to regain the championship in a return bout (1927), he engaged in various commercial activities. He served in World War II, attaining the rank of commander in the Coast Guard Reserve.

Demurrer (*dē-mūr'rēr*), in law, a suspension of the proceedings in a cause until some point is determined by the court. A demurrer is a plea filed to a petition, answer, or reply, and raises a question as to the sufficiency of the case as stated by the opposite party, or some particular part thereof. Only questions of law are raised by a demurrer, which are tried by the court. When a demurrer is sustained, the effect is to lay the pleadings demurred to out of the case, unless the petition is so amended as to avoid grounds on which the court sustains the demurrer.

Denarius (*dē-nā-rī-ūs*), a silver coin used by the Romans. Originally it contained 10 and later 16 of the monetary denomination called *as*, which was a small copper or bronze coin. The gold *denarius* was equivalent to 25 silver *denarii*.

Dengue (*dēng'gā*), in medicine, an infectious tropical fever first observed in Spain in the 18th century. It has sometimes spread epidemically, e.g., in the 1840's in the Southern states of the U.S. From that time on epidemics have flared up in the Southern states, and also in the Balkans. It presented a large medical problem in World War II. The symptoms are pains in the joints, chill, and a rose-colored eruption of the skin. It is not very dangerous.

Deniker (*dē-nē-kār'*), JOSEPH, French naturalist and anthropologist, born in Astrakhan, Russia, Mar. 6, 1852; died in Paris Mar. 18, 1918. After studying in St. Petersburg, and traveling extensively through the Caucasus, Central Europe, Italy, and Dalmatia, he became chief librarian of the Natural History Museum in Paris (1888). A pioneer in the field of modern ethnologic classification of Europeans, he wrote "*Les Races de l'Europe*" (1908) and other works dealing with this subject.

Denikin (*d'yē-nē'kin*), ANTON IVANOVITCH, Russian general, born Dec. 4, 1872; died at Ann Arbor, Mich., Aug. 8, 1947. He served in the Russo-Japanese War, and in World War I as a lieutenant general. In command of the western and southwestern fronts at the time of the Russian Revolution (1917), he aided Gens. Alekseev and Kornilov in raising a "White" Russian army to fight the revolutionists. After the deaths of these generals (1918), he commanded a volunteer army

of 100,000 men, advancing some distance into South Russia, where he established a government.

His regime failed to win popular support, and Gen. Budenny's Red army defeated him in February 1920. Fleeing to Constantinople, he left his troops under Gen. Wrangel. Denikin chose France as his residence in 1926 and has since professed a strong anti-Soviet attitude.

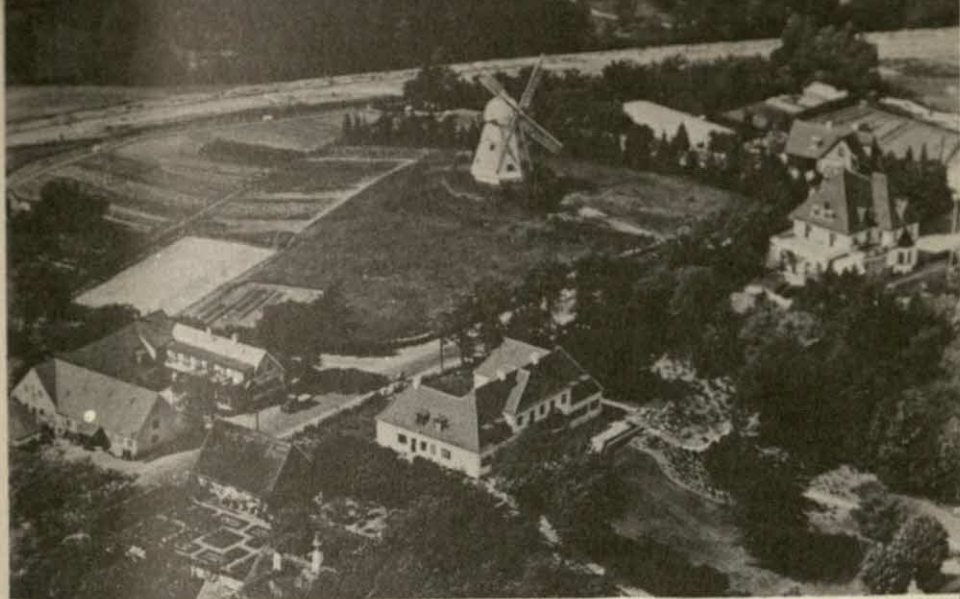
Denis (*dēn'is*), SAINT, the traditional apostle of France and first bishop of Paris. He was sent from Rome about 250 A.D. to preach the gospel to the Gauls and after some detentions reached Paris, where he caused numerous conversions. He and two other Christians were ordered before the Roman governor, and tortured to renounce their faith, and, refusing to do so, they were beheaded about 275.

Denison (*dēn'is'n*), a city in northeastern Texas, situated near the northern boundary of the state. It is on the Southern Pacific, the Kansas, Oklahoma & Gulf, the Texas & Pacific, and other railroads and is the shipping center for the Red River Valley's dairy and poultry products, pecans, peanuts, and cotton. President Dwight D. Eisenhower was born here. About 4 m. N.W. of the city is Denison Dam, the world's largest rolled earth-fill dam, which provides flood control and hydroelectric power for the region. The city was settled in 1872 and incorporated in 1873. Population, 1940, 15,581; in 1960, 22,748.

Denizli (*dē-nēz-lē'*). See *Laodicea*.

Denmark (*den'märk*), a kingdom in the northwestern part of Europe, including the peninsula of Jutland and an archipelago lying east, and comprising among others the islands of Laaland, Zealand, Falster, Funen, Samsø, Læsø, Lange-land, Aerø, Bornholm, and Møen. It is bounded on the N. and W. by the North Sea; on the E. by the Kattegat, the Sound, and the Baltic Sea; and on the S. by Germany. A part of the northern shore is on the Skagerrak. The area, including the Faroe Islands and the islands of the Baltic Sea, is 16,575 sq. m. Nearly the entire country is surrounded by the sea, the peninsula of Jutland being connected with the continent by a narrow neck of land which is less than 40 m. wide.

DESCRIPTION. The North Sea washes the western and northwestern coast, which is low and cut up by bays, but the eastern coast is slightly more elevated and indented by a series of fjords. The Limfjord, in the northern part of Jutland, extends across the peninsula from the Kattegat to the North Sea. The interior of Jutland is crossed by a ridge of hills, extending from the southern frontier to the Limfjord, and forming the watershed between the Kattegat and the North Sea. Gudenaa, the largest river of Denmark, is 100 m. long and flows into the Kattegat. About 80 per cent of the soil is productive, the surface having no elevation higher than 600 ft. above



Courtesy Danish Information Office, N. Y.

DANISH COUNTRYSIDE

sea level. The west coast is largely uninhabitable because of drifting sands, which form a narrow line of unproductive dunes called klitter.

Formerly Denmark had extensive forests of pine and fir, but these trees are now confined chiefly to cultivated lands. The fir was once the most widespread, but now the oak and the beech are the most numerous. Other forest trees include the aspen, ash, elm, birch, willow, and pine, the last-mentioned having been planted to some extent in the marshy and sandy districts. At Copenhagen the mean temperature is about 60° in summer and 32° in winter, and the islands have a somewhat milder climate than that of Jutland. Mists are frequent in summer and heavy rains occur in autumn. Aquatic birds are numerous, and salmon, oysters, and herring abound in the waters off the coast. The climatic conditions are temperate and modified by the sea.

AGRICULTURE. Much of the land is divided into small holdings. The importance of agriculture is constantly increasing; remarkable care and skill are exercised in maintaining fertility and redeeming waste and unproductive lands. Dairy farming is the chief source of profit; the production of milk, butter, and cheese greatly exceeds the home consumption of these products. The co-operative plan is used in fostering the dairy industry as well as some types of general farming. Oats, rye, barley and wheat are the principal crops. Potatoes and beets are grown extensively. Fruits and truck crops are also cultivated widely. Cattle are raised chiefly for dairying purposes; other livestock include sheep, horses, and swine.

MANUFACTURING. Denmark has few mineral deposits, hence its manufacturing enterprises are conducted chiefly on a small scale. Copenhagen

is the chief manufacturing center and is noted for its output of porcelain, silverware, diesel engines, beer, and liquors. Other manufactures include sugar, pottery, cotton and woolen fabrics, boilers, leather goods, and machinery. Iron smelting is carried on to some extent, and fish canning is a productive industry.

TRANSPORTATION AND COMMERCE. All parts of Denmark have convenient railroad facilities, the lines aggregating about 3,200 m., most of which are under government ownership and control. The chief commercial centers are located on the coast. Telegraph and telephone lines furnish communication facilities with all urban and inter-urban points. At present the principal trade is with Great Britain, Germany, Sweden, and the U.S., in the order named.

EDUCATION. An excellent system of public schools is maintained. Attendance is compulsory for those between 7 and 14 years of age. Practically the entire adult population has received elementary education, while many have enjoyed the benefits of higher education. The public schools, colleges, and universities under state or municipal control are maintained by public taxation. Schools for instruction in the industries and agricultural arts in the provinces are liberally attended. The universities at Copenhagen and Aarhus and several technical, agricultural, and commercial colleges are the chief institutions of higher learning.

POPULATION. The people of Denmark are almost exclusively Danes, and there is only a small percentage of Germans and others. They are a Teutonic people of the Scandinavian group, and are characterized by a light complexion, blue eyes, and light-brown or chestnut hair. Lutheranism is the state religion and is the faith of nearly the entire populace, although religious liberty is ex-

tended to all. Copenhagen, the capital and largest city, is located on the island of Zealand, on the Sound. Other cities of importance include Aarhus, Odense, Aalborg, Esbjerg, Randers, Horsens, and Fredericia. Population, 1906, 2,605,268; in 1935, 3,706,349; in 1950, 4,281,275.

GOVERNMENT. The government is a constitutional monarchy (incumbent, Frederik IX). Legislative authority is vested in the national legislature or Folketing, consisting of one house with 179 members (new constitution of June 5, 1953). The king is the chief executive. He is assisted by a prime minister and by ministers of finance, foreign affairs, interior, defense, justice, agriculture, economy and labor, social affairs, education, church, commerce, fishery, and public works. The supreme court of 13 judges is the highest judiciary, under which justice is administered by the courts of appeal and the officials in local communities. Denmark is one of the original members of the North Atlantic Treaty and is as such engaged in rebuilding her defense forces, consisting of an army, navy, and air force, all but destroyed during the German occupation of the country in World War II.

OVERSEAS TERRITORIES. After the Danish West Indies, now the Virgin Islands (*q.v.*) were sold to the United States in 1917 and Iceland (*q.v.*) was recognized as an independent sovereign state in 1918, Greenland (*q.v.*) remained the only overseas territory of Denmark, until it became an integral part of the kingdom in 1953.

LANGUAGE. Danish is a branch of the Scandinavian division of the Germanic languages closely related to the languages of Norway and Sweden. Danish is also spoken in adjoining parts of Germany. Through the many centuries of the Danish-Norwegian union, Danish became the written language of Norway too and remained so until late in the 19th century. Records going back as far as 1,000 years show that the Danish language has changed considerably. Throughout the Middle Ages, German words, at first Low German and later High German, were absorbed to a large degree. Many Latin expressions were retained when Danish was substituted for Latin as the written language during the Reformation, and in the 16th and 17th centuries many French words came into use, some of which were later dropped, however. Nevertheless, the major part of the vocabulary today is of foreign origin.

Danish grammar has reached a stage of development similar to, or perhaps more advanced than, that of English in so far as the elimination of endings, which were so prevalent in Old Norse, is concerned. Thus, verbs have the same form in the plural as in the singular (*de har*—they have, *han har*—he has; *vi havde*—we had; *jeg havde*—I had). Declension has only two cases, the nominative and the genitive, the latter being

formed, as in English, by the addition of *-s* to the nominative (*kvinde*, *kvindes*—woman, woman's; *kvinder*, *kvinders*—women, women's). There are two genders, common and neuter, the common being a contraction of the former masculine and feminine. The definite article (common, *-en*; neuter, *-et*) is added to the noun, with which it forms a single word (*mand*—man, *manden*—the man; *barn*—child, *barnet*—the child).

LITERATURE. Saxo Grammaticus, late in the 12th century, produced "*Gesta Danorum*," in Latin, which is an inexhaustible source of information on early Danish history, culture, and folklore. Codes of common law, compiled about the early 13th century, are the first substantial texts in Danish, but a rich oral tradition of Danish poetry was already in existence at that time.

Modern Danish literature dates from the 16th century, when the Bible was translated and the first hymns were written in the vernacular. Danish literature flourished in the 16th and 17th centuries. The dramatist Ludvig Holberg (1684-1754) was the first Danish writer to become internationally known. The 19th century, however, is the golden age of Danish literature. Under German influence Romanticism flourished under the leadership of Adam Oehlenschläger (1779-1850), a poet who also introduced Norse mythology into Danish literature. During the same period Hans Christian Andersen (1805-75) produced his 164 world-famous fairy tales and many volumes of sensitive poetry, novels, and memoirs. The religious philosopher Søren Kierkegaard (1813-55) was more influential abroad than in his own country with his conception of the relation of the individual to God. Highly influential at home, although hardly noticed abroad, was N. F. S. Grundtvig (1783-1872), a prolific writer of poems, hymns, treatises on history, mythology, and many other subjects. His lasting influence, however, remains on education, for his founding of some of Denmark's famous agricultural colleges.

During the last 30 years of the 19th century, naturalism, inspired by French literature, flourished in Denmark. In this period the greatest influence was wielded by Georg Brandes (1842-1927), a world-famous literary critic. Since then the novel has been the main vehicle of Danish literature. Novelists such as J. P. Jacobsen (1847-85), Herman Bang (1857-1912), Henrik Pontopidan (1857-1943), Martin Andersen Nexø (1869-1954), the Nobel Prize-winner Johannes V. Jensen (1873-1950), and H. C. Branner (1903-) have enhanced world literature. At the same time many sensitive poets have kept Danish poetry on a high level. During the 1930's and 40's the dramatists Kaj Munk (1898-1944), Kjeld Abell (1901-), and C. E. Soya (1896-) re-

vived this somewhat neglected branch of Danish literature.

HISTORY. The territory now comprising Denmark has been inhabited for at least 4,000 to 5,000 years, possibly by the ancestors of the Danes of today. From before about A.D. 800 until about 1050 Danish vikings roamed the adjacent seas, first as pirates preying on Frisian merchant ships and plundering coastal towns and monasteries, later migrating in great numbers as conquerors of eastern England and Normandy. As early as about A.D. 800 the originally patriarchal community of clans had consolidated into national unity under one king, so that Denmark is virtually the oldest nation in Europe. Up to the middle of the 17th century this kingdom comprised not only the territory of present-day Denmark but also the frontier region of now German Schleswig and the provinces of Scania, Halland, and Blekinge in southern Sweden.

Under the impact of royal power and Christian ideology, viking aggression dwindled away or was utilized by the kings in the defense of their realm against the Frankish emperors in the southwest. At the same time they extended their dominion toward the east along the Baltic shores. For centuries, command of the Baltic Sea, one of the leading trade routes between western and eastern Europe, was the main concern of the Danish kings. Norway, commanding the Skagerrak, was soon brought under their control, and the Baltic Sea region was gradually absorbed into the Danish realm.

Around A.D. 1200 Valdemar the Great extended the Danish empire to comprise much of what is today northern Germany, the islands of Öland and Gotland, and Estonia. However, this empire gave way to the rapidly increasing power of the Hanseatic League. Through several centuries intermittent warfare with the Hanseatic cities prevailed, although at various times mercantile consideration helped in the peaceful settlement of Danish relations with the League. Expanded trade relations led to the founding of cities such as Copenhagen and Malmö in medieval times.

During the 15th century, all Scandinavian countries were brought under Danish rule. The crown also received a fee for every vessel passing the narrows of the Sound, and these dues remained the mainstay of Danish revenue until 1857. Although Sweden broke away in 1471, Denmark remained the leading power of northern Europe until the Thirty Years' War in the middle of the 17th century.

The Reformation, which reached its climax in Denmark by 1536, helped to consolidate the political power of the merchant class, and the influence of the landed nobility declined. At the same time the king profited enormously by confiscating the Church's possessions. During the



Courtesy Danish Information Office

THE TOWN HALL OF COPENHAGEN

next century the crown, with the help of the middle class, overpowered the nobility and established itself as the absolute authority.

Between 1560 and 1720, rivalry with the new ascending power of Sweden developed into endless wars. Under the pressure of the other European powers, the struggle ended in a compromise. Denmark, in spite of crushing defeats, was saved from becoming a Swedish province, but, in the mid-17th century, it had to cede to Sweden its three provinces on the Swedish mainland, islands in the Baltic, and parts of Norway. This fact made the Baltic Sea an international waterway.

Social tension, provoked by serfdom and villeinage, was solved peacefully, and the solution laid the foundation for Denmark's future wealth. In 1788, a year before the French Revolution, serfdom was abolished, and a series of sweeping agricultural reforms were carried out which transformed Danish agriculture—within a hundred years—from medieval tillage to one of the world's most modern farm societies.

Siding with France during the Napoleonic Wars brought catastrophe to Denmark. In 1801 the British destroyed the better part of the Danish fleet in the battle of Copenhagen. Denmark, who had up to this time been the second largest naval power of Europe, lost the rest of her fleet in 1807, after a British bombardment of Copenhagen. A subsequent inflation ended in national bankruptcy in 1812 and, in the peace treaty signed two years later, Denmark ceded Norway to Sweden.

The July Revolution of 1830 in France had important repercussions in Denmark. The middle class demanded the end of absolutism and a

share in the government. This was achieved in a new liberal constitution promulgated in 1849. Nationalism then sweeping Europe brought on two wars, in 1848-50 and 1864, with Prussia and Austria over the duchies of Schleswig and Holstein, of which the former was largely and the latter totally inhabited by Germans. The duchies were ceded and ultimately annexed by Prussia. After World War I, however, the Danish-speaking northern part of Schleswig was restored to Denmark subsequent to a plebiscite.

The period between the last Schleswig war and World War II was a time of great economic, social, and cultural development. This development was interrupted, however, by the German invasion of April 9, 1940, and the subsequent occupation of the country by the enemy during the war. Although they first made Denmark a "model protectorate," the Nazis soon used terror to subdue underground resistance. After liberation on May 4, 1945, the Danes set out to reconstruct their impoverished country, which had been more damaged by exploitation than by actual warfare. Recovery was speeded by the Marshall Plan (see *European Recovery Program*), and under the threat of Soviet expansion Denmark signed the North Atlantic Treaty (*q.v.*). In 1953 a constitutional reform was promulgated, permitting female succession to the throne and abolishing the upper chamber of parliament (see also GOVERNMENT).

Dennie (dĕn'ē), JOSEPH, editor and essayist, born in Boston, Mass., Aug. 30, 1768; died in Philadelphia, Pa., Jan. 7, 1812. A graduate of Harvard Coll. (1790), he early became associated with the Federalist movement. He edited (1796-98) the *Farmer's Weekly Museum* for which he wrote his "Lay Preacher" essays. From 1801 to 1809 he edited *The Port Folio*, a Philadelphia literary weekly. Dennie, eclipsed by the younger Washington Irving, was nevertheless an important figure in contemporary literature.

Dennison (dĕn'ē-sŭn), WILLIAM, lawyer and politician, born in Cincinnati, Ohio, Nov. 23, 1815; died in Columbus, Ohio, June 15, 1882. A graduate of Miami Univ. (1835), he was admitted to the bar in 1840 and elected to the state senate in 1848. One of the first members of the newly organized Republican party, in 1859 he was elected governor of Ohio on the Republican ticket. In 1860 he dispatched state militia to help expel the Confederates from western Virginia. From 1864 to 1866 he served as postmaster general.

Denny (dĕn'ē), GEORGE VERNON, JR., educational promoter and broadcaster, born in Washington, N.C., Aug. 29, 1899; died in West Cornwall, Conn., Nov. 11, 1959. A graduate (1922) of the Univ. of North Carolina, he taught drama production, acted, managed a lecture bureau,

and served (1928-30) as director of the Inst. of Arts and Sciences of Columbia Univ. In 1931 he became associate director of the League for Political Education (later The Town Hall, Inc.). He founded and moderated (1935-52) "America's Town Meeting of the Air," a radio program.

Denominator (dĕ-nōm'ē-nā-tōr), the portion of a fraction (*q.v.*) representing the number of parts into which the unit is resolved. The denominator is written below the line indicating division. The denominator of any fraction may be altered without changing the value by multiplying or dividing both numerator (the number above the division line) and denominator by the same number. A proper fraction is one in which the denominator exceeds the numerator.

Density (dĕn'sē-tē), that quality of a body which depends upon the close cohesion of its constituents. It is estimated by the proportion which the bulk bears to the weight. Thus, in two bodies of equal bulk, but differing in weight, the body of greater weight is also of greater density. In two bodies of equal bulk, but of different density, the body which is of greater density contains the proportionately greater amount of matter. In the case of two bodies containing the same quantity of matter, but differing in bulk, the greater density is ascribed to the one which is of less bulk; from this it is seen that the density is directly proportional to the quantity of matter and inversely proportional to the bulk. Study of astronomy and the laws of gravitation has provided the data for ascertaining the density of the earth, which is now assumed to be about five times that of water. Since the surface consists chiefly of oxygen, it has been suggested that the nucleus may be largely of metals. The density of gases, fluids, and solids, as compared with that of water (which is 1), is their *specific gravity*.

Dentine (dĕn'tēn), or DENTIN, the bonelike structure constituting the body of a tooth but harder and denser than normal bone. It consists of a matrix containing tiny parallel tubules, which open into the pulp cavity of the tooth and which hold, while the tooth is alive, filaments of the pulp. See also *Teeth*.

Dentist (dĕn'tist), one who devotes himself to the study and treatment of the teeth and contents of the oral cavity and their diseases; a dental surgeon. See also *Teeth*.

Dentistry (dĕn'tis-trē), the department of medical science and art which is concerned with the prevention, diagnosis and treatment of diseases of the teeth and adjacent tissues, and the restoration of missing dental and oral structures. Operative dentistry is the branch of dentistry concerned with actual operations upon the natural teeth or the soft tissues of the oral cavity as distinguished from those performed in the dental laboratory. Prosthetic dentistry deals with the re-

placement of missing teeth or oral tissues by artificial means.

SPECIALTIES. From the time of Pierre Fauchard (1678-1761), the founder of modern dentistry, until 1902, when Dr. Edward H. Angle brought about the specialization of orthodontics (orthodontia), each individual performed all phases of dental practice. The constant extension of dental knowledge and the development of skills for applying this knowledge, has created now a number of professional dental specialties, such as: *endodontia*—that branch that deals with root amputation and root canal therapy; *exodontia*—that branch of dental science which is concerned with the extraction of teeth; *orthodontics*—that branch that treats the correction of dental irregularities by the movement of malposed teeth to correct positions, the art and science of the treatment of malocclusion; *pedodontia*—the treatment of oral and dental conditions in children; *periodontia*—that branch devoted to the study, prevention and treatment of diseases which affect the supporting tissues of the teeth; *prosthodontia*—that division dealing with reconstruction and rehabilitation by supplying a missing part by artificial means; *oral surgery*—that branch which deals with diseases and accidents of the mouth and adjacent tissues subject to manual or operative treatment.

HISTORY. It has been accepted by many that the barbers or blacksmiths were the original dentists, and thus the modern dental surgeon is an offshoot from the stock from which the general surgeon developed, or from the blacksmith. This is an absolutely erroneous concept. Dentistry began in ancient Egypt along with medicine. Medicine then being a highly specialized profession, one finds among the medical specialties mentioned physicians who treated a single disorder and no more, "some undertaking to cure diseases of the eye, others of the head, others again of the teeth, others of the intestines, etc." In support of this we have upon tomb inscriptions the actual names of dental specialists from 3000 B.C. to 525 B.C., some of whom were known as "treaters of teeth," while others "makers of teeth," thus signifying a difference in work undertaken. The earliest man of this kind was Hesi Ré, "The Chief of the Toothers and of the Physicians," 3000 B.C.

That oral surgery was also performed, is amply shown in a mandible of the 4th Dynasty (2900-2750 B.C.), found in a cemetery at Gizeh. Externally there is no evidence of an alveolar abscess, but two holes have been drilled between the roots of the second premolar and first lower molar. A roentgenogram (X-ray) clearly indicates that there was, however, an abscess in the body of the mandible.

From the many medical papyri dating as far back as 3700 B.C., we learn of references to dental

diseases such as gingivitis, erosion, pulpitis, also of the treatment of "toothache."

In addition to the above we also have proof of actual dental work having been performed during that period, as found in a tomb of about 2500 B.C. This simple retentive dental prosthesis consisted of a gold wire around the lower left second and third molars to retain the latter tooth in its natural position.

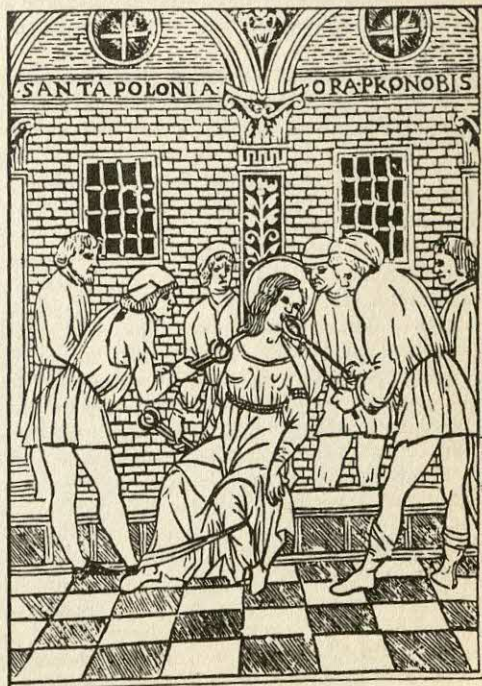
Therefore we now can definitely state that the dental art had its origin in Egypt and as an independent specialty of medicine.

Assyro-Babylonian dentistry followed the course of medicine very closely, for there it was a part of it. In the first literary reference to the therapeutic extraction of teeth, we find that the physician associated diseased teeth with a systemic disturbance, the same thing that modern dentistry had to relearn from William Hunter in 1910. This Assyrian dental diagnosis throws considerable light upon the dental practice of this early period. We are informed of the "barber" performing minor surgical procedures, among which were dental operations such as extractions. Although the "Legend of the Worm" had its origin in Egypt about 1200-1100 B.C., this oldest of incantations, which spread throughout the world,

MARTYRDOM OF ST. APPOLONIA

Fifteenth century woodcut of the patron saint of dentists

Courtesy Bettmann Archive, N. Y.





THE BARBER-SURGEON

Painting by Gerard van Honthorst (1590-1656)

had its greatest belief in Assyria. This worm theory of toothache continued as a scientific fact into the 18th century until disproved by Fauchard. During the 2nd century fumigation with henbane instead of reciting the incantation also became a practice of ridding oneself of the "worm in the teeth."

What little dental knowledge the Phoenician people possessed is represented by the two specimens found within a mile of each other in ancient Sidon.

It is in the writings of the classical Greek scholars that we learn something of the definite character of the Greeks' care and preservation of the teeth. As with the Assyrians, we find the Greeks resorting to extraction of teeth, indicating a breaking away from superstition and fear of injuring nearby organs. Both Herodotus (500 B.C.) and Aristotle (384-22 B.C.) give us some information concerning the treatment of the teeth and mention such instruments as "scrapers" and "extractors"; thus dental surgery must have been known to the Greeks at that time.

Hippocrates' writings (460-377) form the basis of clinical medicine, and in them we find many allusions to dental troubles. His interesting passage, in which he mentions "individuals whose heads are long-shaped . . . have strongly arched palates, their teeth are disposed irregularly, crowding one on the other . . ." shows how much he valued teeth, and it is our earliest orthodontic reference. His interest in oral surgery is demon-

strated by his recorded treatment of fractures of the jaw. Greek dental prosthesis included not only the binding of loose teeth, but the first indication of some artificial bridgework. Aristotle's writings (384-22 B.C.) contain more information regarding tooth structure, formation, care and treatment than any other Greek writings.

The varied and numerous dental appliances, both of fixed or removable types, found in the tombs of the Etruscans, demonstrate that their dental technicians ("tooth-workers") excelled as artificers and that they developed the dental art beyond any of their neighbors. Pure gold was utilized, the soldering was perfect and rivets, neatly applied, were used at times to retain supplied teeth in their proper position.

Not before 218 B.C., when Archagathus, a Greek priest, arrived in Rome, can we find a record that medicine was known or practiced in the Roman Empire. However, if one accepts the Law of the Twelve Tables of about 450 B.C., prosthetic dentistry must have been extensively carried out and practiced at least several hundred years before medicine became established. Although the Laws themselves have been lost, Cicero mentions that "If anyone's teeth have been bound together with gold, it shall be unlawful to bury with it."

The Romans in constructing their bridgework, adopted the ideas of the Etruscans and added to them new methods and principles of technique. Another important contribution by the Roman dentist was the use of the gold shell crown attached to an appliance of gold, the earliest definite example of crown work known.

From the early classical writings of medicine, one learns that dentistry, prior to the Christian era, had established itself with medicine and was considered one of its specialties.

DECORATIONS AND MUTILATION OF TEETH. Among the pre-Columbian Indians of North, Central, and South America, from the 1st to the 7th centuries, A.D., there was practiced, in a new and original form, the earliest examples of operative dentistry. The one question to which we have no absolute answer is what was the purpose and object of these operations.

As no decay around the edges where the inlays were inserted is seen on the surface of the dentine, it shows the delicate and accurate workmanship of the operator, so as not to injure the tooth structure and cause premature decay. The square inlays had beveled edges which were inserted sideways into beveled walls of the teeth, thus we learn of the knowledge of cavity preparation. So far no instruments have been discovered to explain how this cavity preparation was accomplished, except that we do have a record of their use of stone and hard gems in other fields of endeavor. The pain caused in the cavity prepara-

tion and mutilations must have been severe; to ease this the chewing of coca leaves and other herbs acted as desensitizers.

From the 13th to the 16th centuries, little progress was made by dentistry.

Dentistry in Colonial America had its beginning with John Baker of Boston, and Robert Woofendale of New York about 1767, both having practiced dentistry in England prior to reaching our shores. In 1778 James Gardette came to this country from France with a knowledge of French dentistry, backed by experience and with the training of the surgeon of that day. He located in Philadelphia where he continued to practice until 1829, a period of 45 years. Meanwhile Isaac Greenwood, Sr., a native of Boston, began his practice around 1778 and was followed by four of his sons, four grandsons and one great grandson. The most famous of the Greenwoods, however, was John, the pioneer American dental scientist and the most famous of George Washington's dentists.

In the beginning the physician was entrusted with most of the dental work, which consisted mainly in the treatment of toothache and extractions. With the gradual arrival of European "dentists," "surgeon-dentists" and "operators for the teeth" equipped as were the above mentioned men, as well as others that followed with the latest ideas then prevailing in Europe, more at-

tention began to be paid and greater care given to the teeth.

PROFESSIONAL PROGRESS. The entire development of modern dentistry dates from the 19th century, mainly from the latter half. Beginning with comparatively few qualified practitioners and no organized professional basis, educational system or literature, the profession has grown to its present position as a leading member of the healing arts, with practitioners to be found in all civilized communities. In the U.S., there were, in 1946, approximately 75,000 dentists.

Noteworthy progress in dentistry since 1910 has resulted from intensification of scientific research, expansion of dental education, and development of technical skills. Prior to this period the design and construction of artificial dentures for the restoration of lost teeth was largely an empirical procedure dependent upon the judgment, manual skill and artistic sense of the dentist. Scientific studies of the principles involved in the human masticatory function, initiated about 1866 by F.H. Balkwill, have since then been carried on and applied to the point where now, the dentist, aided by new techniques and dental laboratory procedures, may produce artificial dentures that closely approximate, functionally as well as esthetically, the natural dentures.

Modern dentistry places major emphasis upon retaining teeth, rather than removing them.

FIRST DEMONSTRATION OF ETHER AS AN ANAESTHETIC, 1846

Ether was first administered by Dr. William T. G. Morton, surgeon dentist of Boston

Courtesy Bettmann Archive, N. Y.



DENVER

Through X-ray examination, suspected disease may be confirmed, entirely unsuspected conditions may be discovered, leading the diagnostician to a new train of inquiry; and, in routine X-ray examination, disease with symptomless onset may be revealed at so early a stage of development that it will be comparatively easy to eradicate.

As a result of constant improvement in restorative techniques, procedures and materials, teeth lost through accident or neglect may be replaced by artificial substitutes that in many cases are so natural in appearance as to be barely detectable as such. Administration of anesthetics and analgesics desensitizes oral tissues and renders even difficult operations painless.

Dental researches, attacking the causes of tooth decay and other oral ills, are carried on in dental schools, private dental offices, and other quarters, and the results are disseminated through professional journals and scientific meetings, as are new operative techniques and procedures.

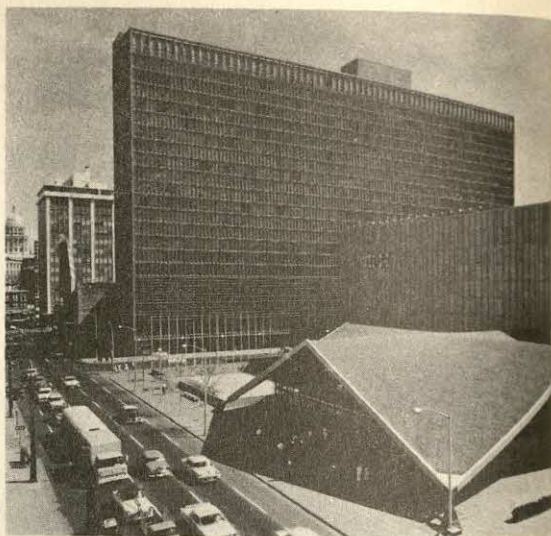
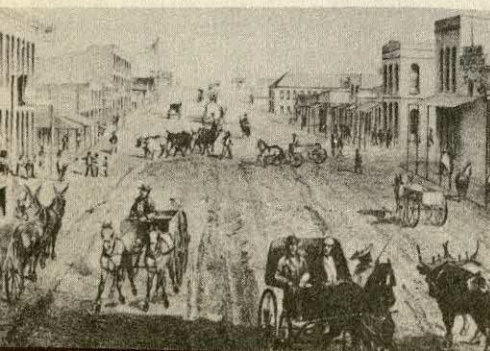
The more than 40 four-year dental schools in the U.S. are large and well-equipped. The profession possesses a large periodical and standard literature in all languages. In most countries, dental practice is regulated by law in the same way as medical practice.

Denver (*dēn'vēr*), city and port of entry in central Colorado, capital of the state and largest city in the Mountain Region, located on the South Platte River, 12 m. E. of the foothills of the Rocky Mts. Generally circular in shape, Denver covers an area of 71.0 sq. m. and because of its elevation (5,280 ft.) is often called the "Mile High City." It is served by the Chicago, Rock Island and Pacific, the Atchison, Topeka and Santa Fe, the Denver & Rio Grande Western, the Union Pacific, and other R.R.'s. Stapleton Airfield is 7 m. from the center of the city.

DESCRIPTION: The city's parks and playgrounds, extending over an area of 2,400 acres, include the Park of the Red Rocks, known for its amphitheater; and City Park (324 acres), with statuary, fountains, botanical and zoological gardens. Denver's residential areas lie in the direction of the outer rim of the city. Sixteenth St. is its major shopping thoroughfare and 17th St. its main

LARAMIE STREET. DENVER, COLO., 1866

Courtesy Doubleday & Co., N.Y.



Courtesy Denver Chamber of Commerce

DOWNTOWN DENVER SHOPPING AREA

office-building and financial area. Grouped around the parklike Civic Center are city and state buildings, the downtown campus of the Univ. of Denver (*q.v.*), and the National Jewish Hospital. Two important religious structures, the Cathedral of the Immaculate Conception (Roman Catholic), and St. John's Cathedral (Protestant Episcopal), are located in the city. A branch of the Mint and many other Federal agencies have offices in Denver.

COMMERCE: Well known as a convention and tourist center, Denver is also an important manufacturing area. Nearby gas fields provide low-cost fuel; water is piped under the continental divide from the west side of the mountains. The petroleum industry employs thousands of people. Manufactures include rubber products, luggage, mining machinery, missiles, electronic and other instruments, chemicals, and food products. Fitzsimons Army Hospital, Lowry Air Force Base, Buckley Naval Station, and an atomic and chemical arsenal are located within the metropolitan area. The city is the center of a standard metropolitan statistical area comprising five counties—Adam, Arapahoe, Boulder, Denver, and Jefferson—and encompassing 3,665 sq. m., with a population in 1960 of 929,383. The value added by manufacture in this area in 1958 was \$562,850,000; in the same year, the value added by manufacture of the city alone was \$339,799,000.

EDUCATION: The public-school system enrolls ca. 80,000 annually; the parochial schools enroll ca. 20,000. The Emily Griffith Opportunity School provides an adult education program in which more than 15,000 persons take part annually in day and night divisions. Institutions of higher learning include the Univ. of Denver, the Iliff School of Theology, Regis Coll., and branches of the Univ. of Colorado. Among the cultural facilities are the Museum of Natural History, the

DENVER, UNIVERSITY OF

symphony orchestra, and the Denver Art Museum.

GOVERNMENT: Denver has a mayor-council type of government. The mayor, nine councilmen, and an auditor are elected for four-year terms; other officials are appointed. In 1902 a state constitutional amendment resulted in the combination of city and county functions into a single unit of government.

HISTORY: Denver was founded as a result of the Colorado Gold Rush of 1859 and was named after Gen. James William Denver (1817-92), territorial governor of Kansas. Early attempts to settle the area were hindered by floods, fires, and Indian raids. The well-known "Sand Creek Massacre," under Col. John Chivington, in 1864, was a reprisal for one of these raids. The city was incorporated in 1864 and became the territorial capital in 1867. Denver experienced frequent changes in its governmental structure until 1902, when it received complete home rule powers.

In the last quarter of the 19th century, Denver experienced considerable growth because of the discovery of silver in Colorado. In this century, the extension of irrigation in farming and the expanding beef cattle industry furthered the economic importance of Denver, which also became a wholesale distribution center for newly established settlements in the Mountain Region.

POPULATION: In 1850 the population was 4,749; it increased to 133,859 in 1900. It expanded from 256,491 in 1920 to 322,412 in 1940 and to 415,786 in 1950. In 1960 the population was 493,887.

Denver, UNIVERSITY OF, an educational institution at Denver, Colo. The university comprises five colleges: arts and sciences, law, engineering, librarianship, and graduate, included in which are schools of music, education, speech, theater, art, social work, public administration, and hotel and restaurant management; also a high-altitude research laboratory on the summit of Mt. Evans. Commerce, law, librarianship, and the evening division occupy the Civic Center Campus, in the center of the city. Arts and sciences and engineering are located on the spacious University Park Campus. The university was founded in 1864. It has a library of over 300,000 volumes, a faculty of over 300, and an annual student enrollment of about 5,000.

Depew (dê-pû'), CHAUNCEY MITCHELL, railroad official, born in Peekskill, N.Y., Apr. 23, 1834; died Apr. 5, 1928. He was graduated from Yale in 1856, studied law, and began to practice in Peekskill. He served in the State Legislature in 1861-62, and in 1863 was elected secretary of state. Subsequently he held other offices, but resigned to resume the practice of law, and in 1875 became general counsel for the entire Vanderbilt system of railways. He was chosen second vice president of the New York Central & Hudson



Courtesy Denver Chamber of Commerce

COLORADO STATE CAPITOL IN DENVER

River R.R. in 1882, three years later became its president, and in 1898 succeeded Cornelius Vanderbilt as president of the entire Vanderbilt system of railroads. He attained a wide reputation as an orator and as an active worker in the interest of the Republican party. In 1899 he was elected a member of the U.S. Senate and was re-elected in 1905. He is the author of "A Hundred Years of American Commerce."

De Peyster (dê-pîs'tēr), JOHN WATTS, author, born in New York City, Mar. 9, 1821; died May 4, 1907. He studied at Columbia Univ. but took no degree. In 1845 he became a colonel in the state militia, was breveted major general in 1866, and assisted in organizing the police department of New York City. He wrote a vast number of articles and pamphlets on historical and military subjects, relating to battles both ancient and modern. His books include: "Personal and Military History of Philip Kearny," "The Dutch at the North Pole," and "Life of Field Marshal Torsenson."

Depression (dê-prê'shūn), in economics, a change in the economic conditions, causing a temporary lull in trade, business, and production, and resulting in falling prices, decrease in earning and buying power, and in mounting unemployment. In the U.S. there have been periodic depressions, those of 1873-75 and 1929-33 having the most far-reaching consequences.

Depth Bomb (dêpth), in naval warfare, a bomb employed against submarines and other submerged objects. Depth bombs are timed to explode at a predetermined depth beneath the

surface; pressure shock causes the damage.

De Quincey (*dē kwīn'sī*), THOMAS, author, born in Manchester, England, Aug. 15, 1785; died Dec. 8, 1859. He was the son of a linen merchant, who died when quite young and left an estate to his widow, the income of which was valued at \$8,000 per year. Thomas received his education at Bath and Oxford, and was noted for his ability to speak Greek fluently at 15. While at the university he acquired the opium habit, which clung to him long after. On leaving college he resided at the Lakes, where he met Coleridge, Southey, and Wordsworth. He returned to London in 1821 and became associated with Lamb, Knight, Hazlitt, and other men of note and learning. A persistent student of German literature, he translated from Richter and Lessing, and induced interest in the works of Kant, Schelling, and Fichte. His writings are pervaded by humor and distinguished by originality. Perhaps no magazine writer of the last century holds a higher place in English literature than he, and no one could write with greater imaginative grandeur. Faultless in style and interesting in detail, his essays have held their place well among readers. His writings include articles in the *London Magazine* and other periodicals. Among his books are: "Confessions of an Opium-Eater," "The English Mail Coach," "Letters to a Young Man," "Logic of Political Economy," and a production entitled "Joan of Arc."

Derby (*dēr'bi*), a city in New Haven County, Connecticut, 10 m. w. of New Haven, at the junction of the Housatonic and Naugatuck Rivers. It is on the New York, New Haven & Hartford R.R. and several bus lines. Derby has manufactures of cotton goods, furniture, machinery, and earthenware. The first settlement was made in 1646, when it was first known as Paugasset, and it was incorporated as Derby in 1675. Population, 1940, 10,287; in 1950, 10,259.

Derby, a city of Derbyshire, England, about 120 m. n.w. of London, on the Derwent River. Among the chief buildings are the chapel of St. Mary's and the Tower of All Saints. Numerous railway lines furnish extensive inland connections. The manufactures include porcelain, silk and cotton goods, paper, machinery, chemicals, ironware, marble, and spirituous liquors. It is surrounded by an agricultural country, in which fluorspar abounds. A station was built on the site of Derby by the Romans, to whom it was known as *Derventio*. It became a royal borough in the time of Edward the Confessor. The city was the home of Herbert Spencer. Population, ca. 140,000.

Derby, a race for three-year-old horses, over a course a trifle longer than a mile and a half, at Epsom Downs, near London, England; instituted in 1780, by the 12th Earl of Derby. In

America, Derby often designates the Kentucky Derby, run at Louisville, one of the "classic" races of America.

Derby, FREDERICK ARTHUR STANLEY, 16TH EARL OF, statesman, born Jan. 15, 1841; died in 1908. He was educated at Eton Coll. and entered the army in 1858. He was elected to Parliament from Preston in 1865, became Lord of the Admiralty in 1868, and was Financial Secretary for War in 1874-77, when he was made Secretary for the Treasury. Subsequently he was made Secretary of War, later Secretary for the Colonies, and in 1888 became Governor General of Canada, serving until 1893.

Derelict (*dēr'ē-lik't*), any property abandoned, deserted, or cast away in such a manner as to indicate that its owner has relinquished all claim to it; usually an ocean-going vessel. However, a ship abandoned at sea either by consent or by compulsion due to weather or unforeseen conditions is not forfeited if any evidence is left thereon of the owner's intent to return.

De Reszke (*dā rēsh'hē*), ÉDOUARD, opera singer, born in Warsaw, Russia, Dec. 23, 1856; died May 30, 1917. He studied with his brother Jean de Reszke, and made his first appearance in public at the Théâtre Italien in Paris in 1876. He is regarded one of the greatest dramatic bassos.

De Reszke, JEAN, tenor singer, born in Warsaw, Russia, Jan. 14, 1852; died Apr. 3, 1925. He began singing in the cathedral at the age of 12, entered upon the study of law, but took up the study of music. For many years he was with the Metropolitan Opera Company of New York City.

Dern (*dēr'n*), GEORGE HENRY, born in Dodge County, Nebraska, Sept. 8, 1872; died in 1936. He was educated in the Hooper public schools, Fremont Normal Coll., and the Univ. of Nebraska. At the age of 22, he took up his residence in Utah as a bookkeeper for the Mercur Gold Mining and Milling Co. of Mercur, Utah. Seven years later he was made general manager of the concern.

Entering politics in 1914, he was elected to the state senate on a fusion ticket of Democrats and Progressives. In 1918 he was re-elected senator on the Democratic ticket, and in 1924 was chosen governor of Utah. He was re-elected in 1928. In 1933 he entered the cabinet of President Roosevelt as Secretary of War.

Derrick (*dēr'rik*), an apparatus for lifting and transporting heavy weights, such as stone in a quarry. It consists of a tall mast fastened on a pin, on which it may revolve, and is anchored by ropes extending from the top to the ground. A boom is hinged near the bottom of the mast, so constructed that the upper end may be raised or lowered by suitable rope tackle, which works through blocks fastened respectively near the

outer end of the boom and near the top of the mast. At the foot of the mast is a system of wheels, with which the tackle block is attached by a rope, and the weight is moved by turning the mast, which causes the boom to swing around. The traveling crane has displaced the derrick in some industries but it is still much used in building construction.

Dervish (*dēr'vish*), a Mohammedan devotee, who takes a vow of poverty and austerity of life. Numerous different orders are maintained. Some dwell in monasteries, others live as hermits, and some live as wandering mendicants. The dancing dervishes are a class that accustom themselves to spin or whirl around for hours at a time, uttering *Allah*, and making violent motions of the body. After they reach a state of exhaustion, they claim to be inspired and to possess the power of curing diseases and interpreting dreams.

Descartes (*dā-kārt'*), RENÉ, philosopher and mathematician, born near Poitiers, France, Mar. 31, 1596; died in Stockholm, Sweden, Feb. 11, 1650. At the Jesuit Coll. of La Flèche, where he was educated, he proved an apt student but soon began to question the formalism of traditional learning. During military campaigns in Holland, Bavaria, and Hungary (1617-21), he embarked on a series of original investigations, particularly in physics and geometry. Following a tour in Italy

flourishing arts and great progress in scholarship; famous men of all nationalities were gathered in her cities. Descartes, however, devoted himself to individual research based on exact science, or evolved from his own thoughts, for he was skeptical of the formalistic approach to research in science which had developed in the scholastic school. He made important discoveries in various scientific fields, but his most significant contribution was in philosophy. He created the basis for modern philosophy by developing a system known as Cartesianism. His philosophical work attracted much attention, and he was invited to Sweden by Queen Christina, who wanted to become his pupil. Unfortunately, his weak constitution could not tolerate the cold northern winters, and he died after about a year in her service.

Descartes' principal works were "Discours de la Méthode pour bien conduire sa raison et chercher la vérité dans les sciences" ("Discourse on Method"), and "Méditationes de prima philosophia" ("Meditations on First Philosophy"). In these works, he tried to discover an absolute element as a basis for human knowledge and understanding. He resolved to accept as truth only those ideas which presented themselves so clearly and distinctly to his mind as to make knowledge evident and exclude all possibility of doubt. For him, evident knowledge, or truth, had to be as clear and distinct as the elements of mathematics. On the basis of primary evident truth and through the process of logic, he was able to deduce new truths. He insisted that each problem to be solved should be divided into as many parts as possible and each part considered in logical order in such a way that nothing of pertinent value could be omitted. Descartes' fundamental premise was his belief in the existence of a thinking being, or "*res cogitans*." "I think; therefore, I exist" (*Cogito, ergo sum*). Secondly, he was equally convinced of the existence of a Supreme Being, or God. As finite beings, we must presuppose an infinite, perfect being: God, the creator of the material world and father of ultimate truth; of Him we know by innate idea.

While he believed that these two basic truths were evident, a conception of the physical existence of the external world did not present itself to him so clearly and distinctly. The impressions received from outside through men's senses are not in themselves adequate proof of the existence of the external world. Descartes solved this problem of the reality of the material world in this way: God has given us our senses; He could not have betrayed us by failing to create at least a certain correlation between things which actually exist outside of our thinking being and our sensual impressions. Proceeding logically, he finally establishes a distinction between three kinds of beings: (1) Created spirits, which we used to call



Courtesy French Press & Information Service, N. Y.

RENÉ DESCARTES

and Switzerland, he settled in Paris and became interested in research on optics. Shortly thereafter he took up a 20-year residence in Holland (1629-49). In this period, Holland was noted for her

the individual souls of men, able to think: (2) the uncreated central spirit that is God, whom we can perceive through innate idea, but about whose qualities we can know nothing. The main difference between the individual soul, or created spirit, and the uncreated spirit, God, is that God is infinite (unlimited) as to time and space, while the individual soul is finite (limited) in both respects; (3) the bodies, created physical matter, to which he attributes certain qualities, such as extension and divisibility.

His system as a whole is distinctly a metaphysical system. The difference between Descartes and his scholastic predecessors lies in his will to discover the absolute element as a foundation of human knowledge and thought. This was his positive contribution not only to modern philosophy, one which laid the foundation for all epistemology (*q.v.*), but also to the problem of freedom of the will, or to ethics in general. These, as well as his contributions to analytical geometry, optics, and the theory of music, were significant but cannot be compared in importance to his attempt to reconcile the metaphysical concept of the world with a critical examination of the possibilities of human thinking.

Descent (*dě-sěnt'*), in law, a passing from an ancestor to an heir, a transmission by inheritance or succession. The laws of most countries are founded upon the principle of equal distribution, both of personal and real property, among the heirs in the nearest surviving degree. The three classes of kindred are direct descendants, ancestors, and collateral relatives; the latter include those who have descended from the same common ancestors. There are two sets of collateral relatives, as well as two sets of ancestors, the *paternal* and the *maternal*. *Lineal descent* is where property descends directly from father to son and from son to grandson; *collateral descent* is where it proceeds to a brother or sister, nephew or niece, or to other collateral representatives. If an individual dies *intestate*, that is, without relatives or without leaving a will, his property usually escheats to the state.

Desert (*děz'ért*), a region in which plant and animal life is very scant or entirely absent. Some writers class the regions that are barren from cold or lack of soil as deserts, such as Greenland and the lands of the Arctic and Antarctic Zones. However, the name is usually applied to the localities of continents that have a climate quite favorable, but whose barrenness is due to the lack of soil or the supply of moisture. Arid deserts are most extensive in Asia, Africa, and Australia, are almost entirely unknown in Europe, and occupy only a small part of the continents of North and South America. The Sahara Desert, which crosses the north central part of Africa, from the Red Sea to the Atlantic, is the largest arid belt of the world.

It extends under different names into Asia, where it is known as the Arabian Desert, the Gobi Desert, and the Salt Desert. The Kalahari Desert, in South Africa, is bounded by the Orange, Zambezi, and Limpopo Rivers. A large part of the interior of Australia is a desert. The Colorado Desert, in California, and the Atacama Desert, in northern Chile, are among the barren regions of North and South America.

Deserts vary considerably in the character of their surface. Some consist chiefly of sand and gravel, which frequently drift to form dunes, and others have a rocky surface. Oases are located in many desert regions owing to the presence of springs, or to the streams that rise from the precipitation of high mountains, irrigating the valleys below. Deserts may be due to the direction of prevailing winds, which deprive them of moisture; distance from the oceans; or isolation by mountain systems. Desert soil may be fertile, needing only moisture to render it productive. See also *Arid Region*.

Desertion (*dě-zúr'shún*), the act of abandoning a service or a person to whom duty is owed. In military usage, desertion implies absence without leave or intent to return. In wartime it is punishable by death. See *Abandonment*.

Des Moines (*dě-moin'*), the largest river in the State of Iowa. It rises in the southern part of Minnesota, flows in a southeasterly direction, and discharges into the Mississippi about 4 m. below Keokuk, after a course of 500 m. Among its principal tributaries are the Raccoon and Boone Rivers. It drains a fertile agricultural country. Belts of hardwood timber are on either side in Iowa, and it passes through regions rich in coal and limestone deposits. Among the cities on its banks are Ft. Dodge, Des Moines, and Ottumwa. It forms the boundary between Lee County, Iowa, and Missouri.

Des Moines, the capital and largest city of Iowa, seat of Polk County, located near the geographical center of the state. It is at the junction of the Des Moines and Raccoon rivers, *ca.* 140 m. N.E. of Omaha, Nebr. The city covers an area of 64.15 sq. m. Its park system comprises *ca.* 1,400 acres and includes more than 50 parks. The state capitol stands in its own park on a hill overlooking the city. The Civic Center, stretching for blocks along the Des Moines River, includes the city hall, library, municipal court building, post office, and a U.S. court house. Veterans Memorial Auditorium seats more than 15,000 persons.

TRANSPORTATION: Des Moines is served by seven railroads, including the Chicago and North Western Ry., the Chicago, Rock Island and Pacific, the Chicago, Milwaukee, St. Paul and Pacific, and the Chicago, Burlington and Quincy R.R.'s. The Municipal Airport is 5 m. S.W. of the city.



Courtesy Des Moines Chamber of Commerce, Iowa

DES MOINES, STATE CAPITOL OF IOWA

INDUSTRY AND COMMERCE: A major industrial, business, and commercial center, Des Moines is headquarters for more than 40 insurance companies and for large publishing and printing firms. Among its manufactures are wearing apparel, tools and machinery, jet-motor parts, agricultural equipment, tires, leather and rubber goods, and food products. The surrounding area produces grains and general farm products, livestock, and dairy products. Des Moines is the center of the Des Moines Standard Metropolitan Statistical Area (1960 pop., 266,315), which includes all of Polk County. In 1958 the city had a value added by manufacture of \$165,856,000.

EDUCATION: Des Moines is the seat of Drake Univ., Grand View Coll., Coll. of Osteopathic Medicine and Surgery, the American Inst. of Business, and other business and trade schools. Cultural facilities include the Art Museum, designed by Eliel Saarinen; the State Historical Bldg., the KRNT Theater, and the Community Playhouse.

HISTORY: Des Moines lies on the site of the second Ft. Des Moines, a U.S. garrison established in 1843 and abandoned in 1846. The settlement that grew up around it numbered about 500 inhabitants by 1851. In 1857 it was incorporated as a city and made the capital of Iowa. A new Ft. Des Moines was established as a cavalry post in 1900. During World War II it became the first training center for the Women's Army Corps; by 1945 more than 40,000 WAC's had been trained there. In 1950 Des Moines

adopted the city-manager form of government.

Des Moines' decade of greatest growth was from 1910 to 1920, which saw an increase from 86,368 to 126,468. In 1950 the population was 177,965; in 1960, 208,982.

Desmoulins (*dă-môo-lăn'*), **BENOIT CAMILLE**, political figure and journalist, born in Guise, France, March 2, 1760; executed in Paris, April 15, 1794. He studied law in Paris and later practiced there. He became a pamphleteer for the revolutionary movement and on July 12, 1789, delivered a passionate address which helped incite the storming of the Bastille (*q.v.*). With Maximilien Robespierre, he acted against the Girondists, but in most of his career he followed Georges Jacques Danton (*qq.v.*). Desmoulins became involved in the proscription of Danton but was himself tried by the Revolutionary Tribunal and guillotined.

De Soto (*dê sô'tô*), a city in eastern Missouri, 35 m. s.w. of St. Louis, on a line of the Missouri Pacific R.R. Situated in a lead, zinc, and barite ore-producing region, it ships mineral products. Manufactures include shoes, clothing, and railroad cars. Population, 1940, 5,121; in 1960, 5,804.

De Soto, **FERNANDO OR HERNANDO**, explorer, born in Extremadura, Spain, about 1496; died on the Mississippi River, May 21, 1542. A descendant of an impoverished family of rank, he was aided by a patron, Pedrarias Dávila, to pursue his university studies. De Soto's first voyage was to the isthmus of Darien in 1519, and a second expedition was made to Nicaragua in

1527. In the following year he explored the coast of Guatemala and Yucatan, and in 1532 led 300 volunteers to reinforce Pizarro and assist in conquering Peru. He was given permission to conquer Florida by Charles V, who in the meantime appointed him governor of Cuba. He undertook the conquest of Florida in 1538 with the idea that he would find wealth fully as great as enriched him in Peru.

De Soto, with a company of 600 men, anchored in the Bay of Espiritu Santo (now Tampa Bay) on May 25, 1539. Landing safely on the shore, the ships were sent to Cuba, and the explorers



FERNANDO DE SOTO

Courtesy Brown Bros., N. Y.

entered upon a continuous expedition for nearly four years in search of fortune and fame, ever allured by the reports of the wealth that lay beyond. The march was characterized by difficulties in crossing streams and marshes, and by the harassing onslaughts of the Indians. De Soto's route lay through northern Florida into Georgia, then south toward Mobile, and finally toward the Mississippi. The expedition reached the Washita River, and in the spring the company, greatly lessened in numbers, returned to the Mississippi. De Soto was disappointed by failure and died. To conceal his death from the Indians his body was wrapped in a cloak and lowered into the waters of the Mississippi. Only about one-half of his companions survived. The survivors sailed down the river in boats and safely reached the Mexican city of Panuco.

Des Plaines River (*də plān'*), a river of the U.S., rises near Racine, Wis., and after a course of 150 m. joins the Kankakee River to form the

Illinois River. The general course is south to Lyons, near Chicago, whence it flows toward the southwest. A low ridge separates its basin from Lake Michigan, and 13 m. of its lower course is utilized in the Chicago Drainage Canal.

Dessau (*dēs'sou*), a city of Germany, capital of Anhalt, 80 m. s.w. of Berlin. It is situated in a valley of the Mulde River, near its junction with the Elbe, and is surrounded by a fertile country. Among the manufactures are cotton and woolen goods, sugar, carpets, pottery, tobacco products, and machinery. Wilhelm Müller, the poet, and Moses Mendelssohn, the philosopher, were born here. Dessau was the scene of a battle in the Thirty Years' War, in 1626, when Wallenstein defeated Count Mansfield at the bridge over the Elbe. Population, ca. 58,000. It came under Russian occupation following World War II.

D'Estournelles de Constant de Rebecque (*dēs-tōōr-nēl' də kōn-stān' də rē-bēk'*), BARON PAUL HENRI BENJAMIN, statesman, born in La Flèche, France, Nov. 22, 1852; died May 15, 1924. After studying and traveling in the Orient, he entered French diplomatic service as counselor of legations at various Oriental courts, London, and at The Hague. Elected to the French Parliament in 1895, he was frequently called upon to serve as his country's representative at international peace conferences. In 1899 he was made permanent French representative to the International Arbitration Society. He was also active in the Paris Interparliamentary Union and played an important part in the London Conference in 1906 and The Hague Peace Conference the following year. His activities in the interest of international peace won for him, with Auguste Beernaert, the Nobel Peace Prize in 1909.

Destroyer (*dē-stroī'yēr*), vessel of war, designed for great speed and striking power, effective against a ship of any size. The modern destroyer was developed (about 1892) to combat the early torpedo boats, small vessels heavily armed with torpedoes which resulted from the development of a practicable torpedo (*q.v.*) late in the 19th century. The rapid success of destroyers brought about a wholesale program of construction of this type of vessel, and, today, destroyers generally comprise the largest part of a fleet.

Standard displacement of destroyers ranges from 1,000 to 2,425 tons, with an over-all length of 314 to 391 ft. They are equipped with engines having a shaft horsepower of 17,000 to 60,000, making possible speeds from 30 to 37 knots. Complement of a destroyer ranges from 268 to 341 officers and men. Armament includes from four to eight 5-in. guns in twin mounts, in addition to antiaircraft weapons and torpedo tubes.

U.S. destroyers are named in honor of deceased officers and men of the navy, Marine Corps, and Coast Guard, former Secretaries of the Navy,

members of Congress, and inventors. See also *Warship*.

Detergent (*dê-tûr'jënt*), generally a composition which cleans. Among the several types of chemical detergents are: an *alkaline detergent*, a water-soluble alkali or alkaline salt having detergent properties but containing no soap; an *anionic detergent*, one producing negatively charged colloidal ions in solution; a *cationic detergent*, producing negatively charged colloidal ions in solution; a *dry-cleaning detergent*, a dry-cleaning aid which, when added to a dry-cleaning solvent, increases its effectiveness; a *nonionic detergent*, producing electrically neutral colloidal particles in solution; a *synthetic detergent*, one produced by chemical synthesis and comprising an organic composition other than soap.

In addition, it is possible to have combinations of two or more types of the detergents listed. See also *Soap*.

Determinism (*dê-tûr'mîn-iz'm*), the doctrine that everything that happens in the universe is determined by definite laws and causes. Democritus of Abdera (*q.v.*) was the first philosopher who articulated this principle in connection with a system. Since his time, the philosophical systems of the western world have been concerned with this problem almost continuously. Thomas Hobbes (1588-1679) was the philosopher most concerned with the problem of determinism.

Sometimes this idea of dependency and determinism refers to the sequence of mechanical cause and effect, sometimes to human volition as depending on motives of intelligence. Thus, physics would be the science of the effects of moving bodies upon each other, ethics would be the science of the effects of intellectual considerations upon our decisions, etc.

In contrast to determinism stands indeterminism, which supposes that the decisions of our will (free will) are independent of either physiological or psychological causes.

Determinism is often confused with fatalism (*q.v.*). Fatalism, like determinism, supposes the dependence of our volition but in contrast to determinism it supposes that the dependence is predetermined by God. In other words, fatalism is a theological and not a philosophical or psychological concept.

De Tocqueville (*də tôe'vil*), ALEXIS. See *Tocqueville, Alexis de*.

Detonator (*dê'tô-nâ-tôr*), a device for discharging explosives, usually employing an auxiliary explosive which produces discharge of the principal explosive. Caps containing fulminate of mercury are regularly used to explode dynamite and nitroglycerin. Detonators used with artillery shells are actuated by clockwork and may be made to produce explosion on contact or at a predetermined time after striking. There are also

charges which are detonated by electric current. See also *Fuze*.

Detroit (*dê-troit'*), a city and port of entry in southeastern Michigan, seat of Wayne County, largest city in the state, and fifth largest in the U.S. It is on the north bank of the Detroit River, opposite the Canadian city of Windsor, with which it is joined by a tunnel (5,160 ft.) and a bridge (9,200 ft.). It is ca. 18 m. above Lake Erie and 10 m. below Lake St. Clair. The city, with an area of 139.6 sq. m., has a river frontage of 14 m.; it surrounds completely two independent municipalities—Hamtramck in the east, and Highland Park in the north. Fort Wayne, a military supply and ordnance center, is within the city limits.

After the disastrous fire of 1805, when every building but one was destroyed, the city was laid out in a design based mainly upon the L'Enfant plan for Washington, D.C. Some traces of this plan remain today in the radiation of main streets from Grand Circus Park and from the area around Campus Martius. Woodward Ave., which extends northward at right angles to the river, divides the city into two almost equal parts and is the principal business street. A few blocks north of the river, three main thoroughfares run at angles from Woodward Ave.: Gratiot Ave. on the east and Michigan Ave. and Grand River Ave. on the west. Washington Blvd. contains hotels and many shops. Griswold St. is the financial center; Lafayette Ave., Fort St., and Second Blvd. contain some notable office buildings. Grand Blvd., a parkway which encloses the older part of the city, begins at the Belle Isle bridge on the east and runs to 26th St. and the river on the West Side.

Parks, playfields, and playgrounds, comprising about 5,111 acres, are well distributed in various parts of the city. Belle Isle Park, located on Belle Isle, a large island in the Detroit River, is one of the finest. It is connected with the city by a bridge and provides many types of recreation. Palmer Park, bordering on Woodward Ave. 6 m. N. of the downtown area, is a favorite play area; and River Rouge Park (1,203 acres), the largest in the city, is in northwest Detroit. Briggs Stadium, close to the downtown area, is the home of the Detroit Tigers (baseball) and Detroit Lions (football).

Among the city's principal buildings are the General Motors, the Penobscot, the Fisher, and the Statler and Sheraton-Cadillac hotels. St. Paul's Cathedral (Protestant Episcopal) and the Cathedral, Church of the Blessed Sacrament (Roman Catholic) are important religious structures. Three of the waterfront Civic Center structures have been completed—the Veterans' Memorial Building, the City-County Building, and the Henry and Edsel Ford Auditorium. Among other pro-

jects are a convention hall and exhibits building, a large hotel on the river front, and the 119-acre Gratiot redevelopment project, intended to house 1,900 families.

In the Cultural Center, an area on both sides of Woodward Ave., about 2 m. N. of the river, are the Inst. of Arts, the Rackham Building, in which Univ. of Michigan extension courses are given, the Children's Museum, the Detroit Historical Museum, the Park Shelton Hotel, the Maccabees Building, the new library and other buildings of Wayne State Univ. and the Detroit Public Library's main building.

TRANSPORTATION: The principal railroads entering Detroit are the Baltimore & Ohio, the Chesapeake & Ohio, the Canadian Pacific, the Detroit & Toledo Shoreline (freight), the New York Central, and the Pennsylvania R.R.'s. Willow Run Airport, one of the commercial airfields, is 31 m. from downtown Detroit. The other is Detroit Metropolitan Wayne County Airport, 16 m. from downtown. The Detroit Municipal Airport offers cargo service to the city.

INDUSTRY: In addition to its supremacy in automobile manufacturing, Detroit has a large variety of other industries, including printing and publishing and the manufacture of lumber and wood products, metals, machinery and electrical machinery, transportation equipment, food and dairy products, textiles and apparel, paper, and household appliances. The harbor holds second place in foreign tonnage in the U.S. It is a major port of the St. Lawrence Seaway trade.

Detroit's economy profits greatly from the industry in its three-county (Macomb, Oakland, Wayne) standard metropolitan statistical area

(1,965 sq. m.; pop., 1960, 3,762,360). Factories here produce 23 per cent of the nation's machine tool accessories, 13 per cent of all metal stampings, and 12 per cent of all wirework, hardware, and gray-iron foundry products. The area's value added by manufacture in 1958 was \$4,312,429,000, of which Detroit produced \$2,086,999,000.

EDUCATION: Detroit's public-school system enrolls about 285,000 pupils annually; parochial schools enroll an additional 88,000 pupils. Institutions of higher education include Wayne State Univ., the Univ. of Detroit, Marygrove Coll., Mercy Coll., the Detroit Inst. of Technology, the Lawrence Inst. of Technology, and the Univ. of Michigan Extension Service. Cranbrook Institutions in Bloomfield Hills include the Cranbrook Acad. of Art; the Merrill-Palmer School, near Wayne State Univ. is an internationally known training center for education in home and family life. The Detroit Inst. of Arts (*q.v.*), directly across Woodward Ave. from the Main Public Library, contains a valuable collection of paintings, sculpture, and other forms of art. The Detroit zoological park is in Royal Oak, a northern suburb.

GOVERNMENT: Detroit operates under a 1918 charter and is administered under a mayor-council form of government. The mayor, city clerk, treasurer, and the nine councilmen are elected for four-year terms. Other elected officials serve six-year terms. Appointees serve indefinite terms.

HISTORY: Detroit was founded on July 24, 1701, by Sieur Antoine de la Mothe Cadillac (*q.v.*), who built a military and fur-trading post at the place of the *détroit*, or strait. The post was named Ft. Pontchartrain du Détroit, but for several

DETROIT'S DOWNTOWN SKYLINE, AS SEEN FROM WINDSOR, ONT.

Both pictures, courtesy Detroit Convention & Tourist Bureau



years the occupied territory on both sides of the river was known as the Detroit settlement. It remained a French trading village until 1760, when it was taken over by the British under Maj. Robert Rogers. Indians under Pontiac besieged the fort for five months, 1763-64. A new fort was built in 1778 above Fort Pontchartrain, and the old stockade was extended to join the new one, called Fort Lernoult. In the 1770's Detroit had a population of more than 3,000 and during the American Revolution was the western headquarters of the British, who finally evacuated the city in 1796. In the War of 1812, Detroit fell again to the British, but the battle of Lake Erie returned it to the U.S. a year later.

It was incorporated as a town in 1802 and as a city in 1815 and reincorporated in 1824. It was the capital of the Territory of Michigan, 1805-37, and the capital of the state, 1837-47, until it was superseded by Lansing.

The advent of the automobile transformed Detroit from a residential, little-industrialized city of 285,000 in 1900 into an industrial center in which mass production and technology have reached their highest development. Workers poured in from every European country, and by 1930 the foreign-born population had increased to 25.9 per cent. Migrants from the South increased the number of Negroes to ca. 500,000 (1959). Through the value of its automobile products, the city advanced to a front rank in industry, but many new and old establishments not connected with automobile manufacture moved to Detroit in the early part of the 1900's, and the two World Wars increased Detroit's industrial capacity still more.

The population in 1837 was 10,000; in 1900, 285,704. The decade of greatest growth was between 1920 and 1930—from 993,678 to 1,568,662. In 1950 the population was 1,849,568; in 1960, 1,670,144.

Detroit Institute of Arts, founded in 1885. In 1927 it moved to its present location at 5200 Woodward Ave. in the Cultural Center in downtown Detroit. The museum's galleries are chronologically arranged in sequence from ancient and medieval art through the Renaissance to contemporary artists. The collection of medieval arms and armor of the late William Randolph Hearst is housed here. The huge mural paintings of industrial Detroit by Diego Rivera are also located here. The institute offers a regular number of lecture courses and gallery talks, and its library contains about 80,000 books and related material on all phases of art.

Detroit River, the channel or strait which connects Lake St. Clair and Lake Erie, and by which the waters of the three upper Great Lakes reach the St. Lawrence River. The Detroit forms part of the Canada-U.S. boundary. The river,



DETROIT INSTITUTE OF ARTS

Murals by Diego Rivera

about 25 m. long, is navigable. See also *Detroit*.

Detroit, UNIVERSITY OF, an independent university founded in 1877 by the Society of Jesus (Jesuits). It includes colleges of arts and sciences, engineering, commerce and finance and general studies; schools of dentistry, law, and graduate studies; and two evening divisions. It is the only nontax-supported university in Michigan and one of the largest Catholic universities in the world. Enrollment is ca. 9,500, including 3,400 evening students; the faculty numbers ca. 550. The value of the buildings, etc., is over \$40,000,000. Affiliated with the university are St. John's Hospital and the Detroit Inst. of Musical Arts.

Deucalion (dū-kā'li-un), in Greek mythology, the son of Prometheus, husband of Pyrrha, father of Hellen, and ancestor of the Hellenes. By building a ship he was able to save himself and his wife from destruction by a flood that Zeus sent upon the earth. After floating for nine days, the ship rested on Mt. Parnassus, and the occupants landed safely. An oracle directed them to throw stones, the bones of the Earth, behind their backs in order that the loss of mankind might be repaired. The stones thrown by Deucalion turned to men, and the stones thrown by Pyrrha turned to women. See also *Deluge*; *Noah*.

Deuterium (dū-tēr'i-um), an isotope of hydrogen (H^2) with the atomic weight 2.01356. Deuterium oxide is "heavy water," with the formula H_2^2O . See also *Hydrogen*; *Isotopes*.

Deuteron (dū-tēr-ōn), the nucleus of deuterium, with a mass of 2. It bears one positive electric charge. See also *Accelerators*.

Deuteronomy (*dū-tēr-ōn'ō-mŷ*), the fifth book of the Pentateuch and of the Bible. Traditionally, Moses himself wrote this part of the Holy Scriptures, with the exception of the last four chapters, in which the closing events in the life of the great lawgiver are narrated. It repeats the laws which had previously been promulgated, hence the name (from Greek words meaning "second law"). It tells what occurred in the wilderness during about five weeks, from the beginning of the 11th month to the early part of the 12th month, in the 40th year after the Israelites departed from Egypt. Recounted are the events which had taken place in Israelitic history, with many references to special phases of the law received at Sinai. It is concerned with religious practices and social ethics.

De Valera (*dē vā-lār'q*), (EDWARD) EAMON, Irish statesman, born in New York in 1882. His father, Vivian De Valera, was of Spanish descent and lived in New York. He spent his childhood with his mother's people in County Cork, and was educated at Blackrock Coll. and the Royal Univ., Dublin. He was early imbued with the ideas of the Irish Separatists struggling against British rule. He was sentenced to death for the leading part he took in an abortive uprising in Dublin in 1916, but was later freed.

Soon after World War I, he was elected head of the Sinn Féin (*q.v.*) and called to the Dáil Éireann (1919-22). He succeeded in organizing a strong party (Fianna Fáil or Soldiers of Destiny) in support of Irish independence. In 1932 he was elected president of the executive council, which office he held until 1937, when he became prime minister of Éire (*q.v.*) and the country's guiding spirit. Primarily because of his influence, Ireland maintained neutrality in World War II.



EAMON DE VALERA

In 1948 he lost the office after a parliamentary election; but he regained it in 1951, only to lose it in 1954. He reassumed it in 1957 and in 1959 was elected to the presidency.

Devil (*dēv'il*), in theology, the sovereign spirit of evil, corresponding to the *Satan* of the Hebrews and the *Iblis* of the Mohammedans. In the Bible the devil is represented as the evil one and the father of lies. He is regarded as a rebel against God, as a being perfect in every kind of skill and knowledge, which he uses to pervert man and entangle him in the meshes of sin. In the Middle Ages, even as late as the 17th century, the belief in evil spirits was very common. In many instances, when a man of genius had made a scientific discovery or accomplished some extraordinary feat, it was supposed that his mind was assisted by the devil in some mysterious way.

As sovereign of the demons, the devil held a prominent place in the practice of magic and in many of the poetical legends. In the mysteries (*q.v.*) he was often represented on the stage with flaming eyes, hooked nails, cloven hoofs, spreading horns, black complexion, and sulfurous odor. Milton and Klopstock, the former in the character of *Satan*, and the latter in that of *Abbadonna*, portrayed the devil as a fallen angel, still somewhat dignified amid the ravishments of sin. The doctrine of the Fathers of the Church, founded upon certain passages of the Scriptures, makes him the enemy of God and the leader of a group of angels who deserted God, now suffering chastisement for his crimes and destined to eternal punishment. See also *Demon*.

Devil Fish, a fish belonging to the ray family, common to the waters of the Atlantic and Pacific coasts. It has winglike fins on each side, and the head is truncated in front, giving it a peculiar appearance when moving in the water. It has teeth only in the lower jaw and feeds on small animals which it strains out of the water.

Devil's Advocate (*dēv'ilz ād'vō-kāt*). See *Advocatus Diaboli*.

Devil's Island (*dēv'ilz ī'land*) or ÎLE DU DIABLE, one of three small islands, known as the Safety Islands, off the coast of French Guiana. For ca. 100 years, until 1946, Devil's Island was used as a penal colony. Alfred Dreyfus (*q.v.*) was imprisoned here from 1895 to 1899.

Devils Lake (*dēv'ilz lāk*), a city in North Dakota, the county seat of Ramsey County; located on the Great Northern and Soo Line R.R.'s. Devils Lake, situated in a fertile agricultural region, manufactures concrete and markets dairy and farm products. It is the seat of the North Dakota State School for the Deaf. The city was incorporated in 1887. Population, 1940, 6,204; in 1950, 6,427.

The lake which gives its name to the city is ca. 30 m. long and 10 m. wide; its surface is

DEVILS TOWER

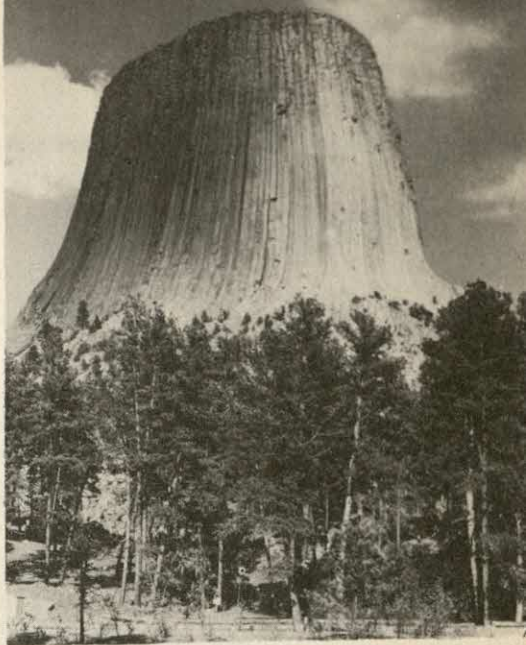
1,465 ft. above sea level. The water is saline and shallow, and the lake has no visible outlet. In the last 70 years the water level has dropped about 25 ft.

Devils Tower National Monument (*děv'-ilz tou'ēr nāsh'ūn-əl mōn'ū-mēnt*), the first national monument in the U.S., located in north-eastern Wyoming. It was established in 1906 to preserve the Devils Tower, a vertical mass of gray volcanic rock. The tower (ca. 720 ft. high) was formed by erosion from the remnants of igneous rock which filled the neck of an old volcano.

De Vinne (*dē vīn'ē*), THEODORE LOW, printer and author, born in Stamford, Conn., Dec. 25, 1828; died Feb. 16, 1914. He started his career at the age of 14 as a printer's apprentice. Moving to New York City in 1848, he joined a printing firm of which he became successively junior partner (1858) and sole owner (1877). The firm was incorporated as The De Vinne Press in 1908. He was noted for his fine craftsmanship, particularly in wood engravings and half-tone plates. Outstanding among his achievements were the "Century Dictionary" and an edition of the Book of Common Prayer. He wrote many notable books on the history and technique of printing, including "The Invention of Printing" (1876), "The Practice of Typography" (4 vols., 1900-2, 1904), "Title-Pages as Seen by a Printer" (1901), and "Notable Printers of Italy during the Fifteenth Century" (1910).

Devolution (*děv-ō-lū'shūn*), WAR OF, a war of 1667-68, deriving its name from an ancient law of Brabant, which provided that upon the death of one partner of a married couple, the survivor enjoyed only the use of a property, while the title devolved upon the children. Louis XIV of France invoked this law in behalf of his wife Marie Thérèse, after the death of her father Philip IV of Spain. Alleging that her dowry had not been paid, Louis claimed the Spanish Netherlands as compensation and seized a large portion of the territory. Holland, England, and Sweden joined in an alliance against him in January 1668, and by the Treaty of Aix-la-Chapelle (*q.v.*), in the same year, Louis agreed to terms which restored the disputed territory to Spain but left him in possession of 12 strategically located towns along the Netherlands frontier.

Devonian (*dē-vō'nī-ən*), one of the rock systems of the Paleozoic era. Generally considered to be from 265,000,000 to 320,000,000 years old, it is placed between the Silurian and Carboniferous systems. The name given to this system derives from Devon, England, where the strata were first distinguished from those of the Silurian and Carboniferous by Sir Roderick Murchison. The rocks of this system are usually divided into three units, Lower, Middle, and



Courtesy Dept. of Commerce & Industry, Wyo.

DEVILS TOWER NATIONAL MONUMENT

Upper, and are found in central and southern Asia, southern Africa, Australia, New Zealand, Greenland, South and North America, and Europe. The best known of the fossiliferous sediments are found in southwestern England, western Germany, Bohemia, and New York State. The abundant fossil remains include brachiopods, bryozoans, corals, crinoids, cephalopods, crustaceans, and mollusks; fish are numerous, and remnants of the first land animals are found in the Upper Devonian sediments of Greenland. Many of the Devonian deposits are red in color. In America there is a noticeable thickness of Upper Devonian strata, which in New York State comprises the whole of the Catskill Mts. The greatest known accumulation of Devonian sediments is in Australia; it approximates 24,000 ft.

De Voto (*dē vō'tō*), BERNARD AUGUSTINE, writer, born in Ogden, Utah, Jan. 11, 1897; died in New York City, Nov. 13, 1955. He was graduated from Harvard Univ. in 1920. He taught at Northwestern Univ. (1922-27) and at Harvard (1929-36), edited "The Easy Chair" in *Harper's Magazine* (from 1935), and was on the editorial board of the *Saturday Review of Literature* (1936-38). Besides his authoritative works on Mark Twain, two of his best-known books are "Year of Decision: 1846" (1943) and "Across the Wide Missouri," (1947; Pulitzer Prize for history, 1948). He won a National Book Award (gold medal, 1953) for "The Course of Empire" (1952).

De Vries (*dē vrēs'*), HUGO, Dutch botanist, born at Haarlem, Holland, in 1848; died May 21, 1935. A professor at the Univ. of Amsterdam (1878-

1918), he is noted for effecting an important change in the method of studying evolution; instead of observing the results of natural selection, a slow procedure, he developed experimental mutation.

He was one of a few scientists who early recognized the importance of the work of Gregor I. Mendel (*q.v.*). Other de Vries experiments concerned osmosis and plasmolysis. Best known of his many scientific books are: "Intra-cellular Pangenesis" (1889), "The Theory of Mutation" (2 vols., 1901-03), and "Plant Breeding" (1907).

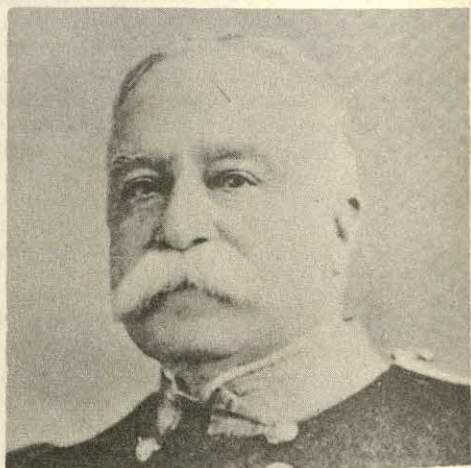
Dew (*dū*), a condensation of moisture from the atmosphere in the form of minute globules upon the surface of certain bodies. On a glass filled with cold water, set out on a warm day, small drops of water form, which are derived entirely from the air. This is caused by the temperature of the air, coming in contact with the cold side, being lowered below the dew point; thus, it deposits the surplus moisture beyond its power of retention. The dew seen on plants and other objects has a similar origin. The earth absorbs more heat during the day than it emits, and at night, when the supply of warmth is cut off, it continues to radiate heat. Objects above the surface of the earth cool more rapidly than the air or the earth, thus resulting in a formation of dew as the air or radiated warmth comes in contact with plants and other objects above the surface. Dew is deposited as hoarfrost when the objects are colder than 32° F.

Dew accumulates much more readily on some objects than on others, because some substances radiate their heat more rapidly than other bodies. The deposit is greater during a clear night than when it is cloudy, for the reason that the earth and air cool more readily when it is clear. The reason that more dew is deposited on a still night than when it is windy is due to the fact that air must remain for some time in contact with cold objects to enable them to lower its temperature and collect its moisture. The amount of dew deposited in warm countries greatly exceeds that of cold regions, and in some regions it is one of the principal sources of moisture for the growth and development of plants. Air is said to have reached its dew point when it contains all the moisture it is capable of holding. The dew deposited is from a comparatively thin stratum of air in the immediate proximity of the cool object. The general precipitations, including rain, snow, and hail, are caused by the cooling of large masses of air.

De Wet (*de-vēt'*), CHRISTIAN, military officer, born in South Africa in 1853; died Feb. 5, 1922. His early life was spent on a farm and he was educated in private schools. He took part in the war of 1880-81 between the Transvaal and Great Britain. At the outbreak of the final war between

the two countries, in 1899, he received an important command in the Boer Army and fought efficiently until his final surrender to Lord Kitchener (*q.v.*). He remained a vigorous nationalist and in 1914 supported the revolt against the South African government.

Dewey (*dū'i*), GEORGE, admiral of the U.S. Navy, born in Montpelier, Vt., Dec. 26, 1837; died Jan. 16, 1917. He entered the Norwich Military Acad. at the age of 15 and two years later the Naval Acad. at Annapolis, from which he was graduated in 1858 in a class of 65, taking rank as fifth in the class. In the Civil War he served in the West Gulf squadron, which came under the command of Adm. Farragut in February 1862. He attained distinction on account of bravery and efficiency under numerous circumstances, and rendered valuable service in the Battle of New Orleans and two attacks on Ft. Fisher. In



GEORGE DEWEY

the early part of 1865 he was made lieutenant commander, and served with the European squadron the first two years after the war. In 1875 he became commander, was advanced to the rank of captain in 1884, having in command the *Dolphin* of the White Squadron, and the next year was transferred to the *Pensacola*, the flagship of the European squadron. He served as commander in several responsible positions in 1888 and, after being made commodore, became the chief of the board of inspection and survey.

In the early part of 1898 he was ordered to sea and given command of the Asiatic squadron, which took an important part in the war with Spain. On May 1, 1898, he entered Manila Bay and destroyed the Spanish fleet without the loss of a man or ship, on account of which he has been named the "Hero of Manila." As soon as the Battle of Manila was reported, President Mc-

Kinley made him an acting rear admiral. Congress voted resolutions of thanks and passed a bill under which he might receive promotion to the rank of rear admiral. On Mar. 4, 1899, he was made admiral, being the third to hold this highest position in the navy of the U.S. A demonstration was given in his honor on Sept. 29, 1899, at New York City, when he returned to the U.S. For this occasion many distinguished men were present, the celebrated Dewey Arch was constructed, and the character of the celebration far surpassed any reception ever previously given in America. Similar receptions were afterward given in Washington and in his native city. In the same year the American people presented him with an excellent residence as a token of appreciation of his valuable service.

Dewey, JOHN, philosopher and educator, born in Burlington, Vt., Oct. 20, 1859, died in New



JOHN DEWEY

York City, June 1, 1952. Dewey was one of the founding fathers of the philosophy known as pragmatism (*q.v.*). Dewey developed pragmatism in an original manner, however; his name is especially associated with the version called instrumentalism. His central philosophical ideas were evolved in connection with concrete problems of educational theory and practice, and his international reputation rests primarily on his contribution to the philosophy of progressive education. In America, however, he was influential not only in educational and professional philosophical circles, but also in the development of fundamental ideas in economics, jurisprudence, anthropology, political theory, and psychology. He was one of the foremost spokesmen in the U.S. for the democratic way of life.

Dewey was graduated from the Univ. of Vermont (1879) and received his Ph.D. degree from

Johns Hopkins Univ. (1884). Under the influence of Prof. George S. Morris, he accepted for a number of years some of the basic tenets of Hegelian idealism, a system of philosophy which at that time was beginning to influence academic thought in America. The ideas Dewey absorbed from Hegel enabled him to overcome the sharp oppositions which he inherited with the New England religious orthodoxy into which he had been born—oppositions or dualisms such as that between the physical and the spiritual, the empirical and the rational, and the individual and the social. Although he subsequently abandoned the metaphysical foundations of the Hegelian system, Dewey readily admitted that Hegel left a permanent deposit in his thinking. After completing his graduate studies, he taught for some years at the state universities of Michigan and Minnesota. By the time he went to the Univ. of Chicago (1894) he had emancipated himself almost entirely from the idealistic elements in Hegel. A dual influence now began to shape his intellectual development: the biological interpretation of human experience, especially as contained in William James's biologically oriented *Psychology*; and his own experiences with the theoretical and practical educational problems that emerged in the Laboratory School connected with the Univ. of Chicago. Dewey gradually worked out a pragmatic, instrumentalist conception of the function of reason in human experience, though it was not until many years later (in his "Experience and Nature," 1925) that he formulated systematically his views on man's place in the universe. He left Chicago in 1904 for Columbia Univ. in New York City, and spent more than 40 years thereafter, even after his retirement from active teaching in 1930, reformulating, expanding, and deepening the bearings of his central philosophical conceptions upon almost every variety of human concern.

The heart of Dewey's general philosophy was his conception of man as a socio-biological organism, in constant interaction with its complex environment, possessing traits that are both continuous with the rest of nature and also distinctive of the human species. In stressing the continuity of man with nature Dewey rejected all supernatural interpretations of man's origin, destiny, and modes of behavior. But he also maintained that through reflective thought, a mode of behavior peculiar to the human organism, men are enabled to reconstruct their environment in the interest of deliberately selected goals. Dewey viewed reflective thinking as generated by specific problems which disturb the settled patterns of living; and he took the aim of such thinking to be the reorganization of the environment so as to permit the organism to function more smoothly and effectively. Accordingly, human reason is systematically described by Dewey as an instrument of adjustment and

reorganization, an instrument rooted in the biological structure of the human species and molded by man's social environment. Ideas are thus not pale reflections of an otherwise inaccessible reality; they are plans of action, whose worth must be established in terms of their adequacy as blueprints for solving the problems for which they have been invented. There is, therefore, no bottomless gulf dividing reason from sense-experience, for sensory experience and rational analysis are cognate activities jointly required for achieving warranted knowledge. In brief, the human mind is not a peculiar kind of mental substance, distinct from and alien to the human body; on the contrary, it is the mode of behavior manifested by human bodies when the latter are engaged in intelligently controlling their environments.

In terms of this conception of mind as intelligence, Dewey attempted to show that most of the traditional difficulties connected with giving an adequate interpretation of science and morals could be readily overcome. He was tireless in insisting that the natural sciences do not disclose some ultimate reality, superior to the world of familiar experience; and he argued vigorously that scientific method is not inherently limited in its application to the domain of physical phenomena, but that it can be used equally successfully in dealing with problems of moral and aesthetic evaluation. Moreover, Dewey tried to show that systems of morality which introduce a sharp cleavage between means and ends rest on a superficial analysis of the facts. For means and ends, he argued, are related as parts are to wholes, so that whoever accepts certain means thereby commits himself to definite ends as well. One important consequence which he deduced from this discussion of the means-ends relation, is the central position of democratic methods in any adequate scheme of the good life, whether the methods are employed in politics, education, or science. Democratic methods, he asserted, constitute part of the ends which define a liberal, creative personality, as well as a progressive, justly ordered society. "Full education," he declared, "comes only when there is a responsible share on the part of each person, in proportion to capacity, in shaping the aims and policies of the social groups to which he belongs. This fact fixes the significance of democracy. . . . It is but a name for the fact that human nature is developed only when its elements take part in directing things which are common, things for the sake of which men and women form groups—families, industrial companies, governments, churches, scientific associations."

Among his more important writings the following are especially significant: "The School and Society" (1899), "Democracy and Education" (1916), "Human Nature and Conduct" (1922), "Experience and Nature" (1925), "The Quest for

Certainty" (1929), "Art as Experience" (1934), "Logic" (1938), and "Problems of Men" (1946).

Dewey, MELVIL, librarian, born in Adams Center, N.Y., Dec. 10, 1851; died in Florida, Dec. 26, 1931. He studied at Amherst Coll. and subsequently became a librarian. Dewey greatly helped in advancing the profession and was a cofounder of the American Library Assn. His positions included a professorship at Columbia, and he was director of the New York State Library School (1887-1906) and of the New York State Library (1889-1906). He originated the Dewey decimal system of book classification now used in libraries. He published "Library School Rules" (1891) and "Decimal Classification and Relative Index"; editions of the latter were published for over 50 years (1876-1929). He also edited *Library Journal* (1876-81) and *Library Notes* (1886-98).

Dewey, THOMAS EDMUND, lawyer and politician, born in Owosso, Mich., Mar. 24, 1902. After



Wide World Photos

THOMAS E. DEWEY

taking his LL.B. at Columbia Univ. (1925), he was admitted to the bar (1926). Six years of private practice were followed by appointments as Assistant U.S. Attorney (1931-33), and U.S. Attorney for the Southern District of New York (1933). He gained nationwide attention as special prosecutor of an investigation of crime in New York City (1935-37). District attorney for New York County (1937-42), he was elected governor of the State of New York on the Republican ticket in 1942, 1946, and 1950, but refused to run for reelection in 1954. He was twice the Republican nominee for President, but was defeated by F. D. Roosevelt in 1944 and Harry S. Truman in 1948.

De Witt (de vit'), JAN, statesman, born in Dort, Holland, in 1625; died Aug. 20, 1672. He was the son of Jacob De Witt and from him

inherited a hatred of the family of William Prince of Orange, afterward William III of England. He was given chief command in the war begun against England in 1655, holding that position until the war's end. His influence was lost when Louis XIV of France invaded the Spanish Netherlands in 1672, involving Holland in war. Soon after William of Orange became governor and received an appointment as commander of the Dutch forces. Cornelius De Witt, brother of Jan, had been tried and imprisoned for conspiracy against the life of the stadtholder or governor, when he was visited by Jan De Witt. Tumults arose among the people on this occasion and both were murdered.

De Witt, JOHN LESENE, soldier, born in Ft. Sidney, Neb., 1880, He left Princeton Univ. in his sophomore year to fight in the Spanish-American War and was commissioned a second lieutenant. He remained in the Army, being graduated from the Army School of Line in 1907. He served in various posts, being promoted through the ranks to major general in 1936. In 1941 De Witt was placed in command of the Western Defense Area of the U.S., with the task of evacuating the Japanese from the West Coast to inland detention camps. He became commandant of the Army and Navy Staff Coll. in 1943, and at the end of the war retired from active duty.

Dextrin (*děks'trīn*), a brownish-white compound found in nature, as in the sap of plants, and formed by the action of heat or acids on starch. It is soluble in water and may be purified by precipitating it with alcohol. Dextrin is used in medicine as a substitute for gum arabic, in calico printing, and in stiffening textiles. It is employed to a large extent on the back of postage stamps.

Dhaulagiri (*dow'la-gī'ri*), MOUNT, a mountain peak of the Himalaya, in Nepal and India. Its height of 26,810 ft. is exceeded in the Himalaya group by Everest, Kanchenjunga, E-1 (or Lhotse), and Makalu.

Diabase (*dī-ā-bās*), a crystalline rock of the igneous group, composed of feldspar, pyroxene, and lime soda. The texture is crystalline throughout and the composition is hard and compact. Feldspar found in diabase is usually formed in bladed crystals, which give the rock a mottled appearance, especially if the grains of pyroxene are coarse. Some specimens have a green color, owing to the presence of olivine. Diabase formations are widely distributed. They occur in the Keweenaw Peninsula of Lake Superior, in the Palisades of the Hudson River, in the Deccan of India, and in several sections of the Scandinavian Peninsula.

Diabetes (*dī-ā-bē'tēz*), a disease which is attended by an excessive discharge of urine. It is of two forms, *diabetes insipidus*, which is marked

by excessive secretion of urine which contains no abnormal constituent, and *diabetes mellitus*, in which the secretion of urine is excessive and contains saccharine matter. Both forms are attended by great thirst and hunger. Diabetes is caused by defective action of the pancreas, causing an excess of sugar in the blood, and some of the sugar is secreted by the kidneys into the urine. *Diabetes mellitus* is a serious disease, since the liver cannot assimilate starches and sugars, which therefore gradually poison the whole body. However, today diabetes has lost much of its seriousness since the insulin (*q.v.*) treatment has proven very effective. During this treatment, diabetes patients are sometimes allowed to relax their ordinarily strict diet; this relieves nerve strain, thus aiding toward recovery.

Diaghilev (*dē-āg'i-lēf*), SERGEI PAVLOVICH, ballet producer, born at Novgorod, Russia, 1872; died in 1929. He was the founder of the famous Ballet Russe at Paris (1909). He was graduated from St. Petersburg Conservatory (1892). Joining the staff of the Imperial Russian Theater (1899), he collaborated with its director, Michael Fokine, and the painter, Leon Bakst, in raising the ballet to new heights of artistry, improving the stage management and adapting the ballet to well-known orchestral works, as well as commissioning modern composers to write new ballet music. Nijinsky (*q.v.*) was premier danseur of the newly-formed Ballet Russe in Paris whose first success was "L'Oiseau de Feu" (1910), with music by Igor Stravinsky. Thereafter Diaghilev's company visited New York and London.

Diagonal (*dī-āg'ō-nal*), a line joining two non-adjacent corners of a polygon. The triangle has no diagonals, but the rectangle has two equal diagonals each of which divides the rectangle into two congruent triangles. The number of diagonals increases rapidly as the number of sides of the polygon is increased. A polyhedron may also have a diagonal between two corners not on the same face.

Diagoras (*dī-āg'ō-ras*), ancient Greek philosopher and poet, surnamed the Atheist, lived about 425 B.C., in the time of Socrates. He turned against the gods of Greece because a wrong done to him went unpunished, and on account of blasphemous speeches was obliged to leave Athens. In making his flight he was shipwrecked and perished. None of his works is now extant.

Dial (*dī'al*), an instrument for ascertaining the time by means of the shadow of a style or gnomon, through the agency of the rays of the sun or moon thrown upon a graduated plate or disk. It is certain that the dial is the invention of the Asiatics. When Ahaz went to Damascus in 771 B.C., he saw a beautiful altar and sent plans of it to Jerusalem. On his return an altar was constructed with a dial which is mentioned in

connection with the cure of his son Hezekiah 13 years after the death of Ahaz. This is, perhaps, the first dial on record and is somewhat earlier than the eclipse of the moon observed at Babylon as recorded by Ptolemy.

Dials were in general use before watches and clocks became common as timekeepers. They are of various construction, and may be upright, horizontal, or inclined. The common dial has a horizontal plane, or dial plate.

Dialectic (*dī-ă-lēc'ē-tic*), a term originally used in ancient Greek philosophy for the purpose of arriving at the truth by discussion and debate. Plato (*q.v.*) employed it for the intellectual process which, starting with the familiar objects of sense, enables the mind finally to grasp the basic and universal principles of reality. The term suffered a change in meaning at the hands of Aristotle (*q.v.*), who understood by it the art of disputation and the mode of reasoning which establishes probable conclusions from premises that are not self-evidently true.

The meaning of the term underwent even greater transformations in modern philosophy. Kant (*q.v.*) employed it for the critical study of the illusions that arise when the mind attempts to deal in a scientific manner with things which are not in space and time. With Hegel (*q.v.*), the use of the term is still different and has exercised great influence upon subsequent writers. Hegel understood by it the necessary self-development of thought and reality. According to him, this development takes place in cycles of three stages each (thesis, antithesis, and synthesis), the

third stage representing a fulfillment of the previous ones and at the same time constituting the starting point for a new sequence of evolution. In Marxism (*q.v.*) and the official philosophy of Soviet Russia, the term is employed in several distinct though allied senses. In one sense, it refers to the inherent pattern of social change, according to which social stability is followed by reaction, and is then succeeded by revolution. It is also used to refer to the process whereby man as an active agent in history interacts with his material environment in order to transform the latter. In a third sense it denotes what are claimed to be the basic laws of all change and of scientific method. The three laws usually cited in this connection are: the law of the unity and strife of opposing forces, the law of negation of negation (according to which each stage of development is a synthesis of the contradictions present in earlier stages), and the law that variation in quantity eventually yields radical changes in quality.

Diameter (*dī-ām'ē-tēr*), a straight line drawn through the center of a circle or sphere, terminating at two opposite points of the circumference. A circle is divided into two equal parts by its diameter, which is its greatest chord. A diameter of a cylindrical body is that of one of its circular sections. The diameter of a body is found by dividing its circumference by 3.1416.

Diamond (*dī-ă-mūnd*), one of the most valuable, and the hardest, of precious stones. It is the purest form of carbon. Diamonds are found

SURFACE OPENING AND BUILDINGS OF A SOUTH AFRICAN DIAMOND MINE

"Pipe" mines, formed at the throats of extinct volcanoes, have been worked to a depth of more than 3,000 ft.

Pictures courtesy N. W. Ayer & Son, N. Y.





DIAMOND MINERS

The blue ground is mined hundreds of feet below the surface

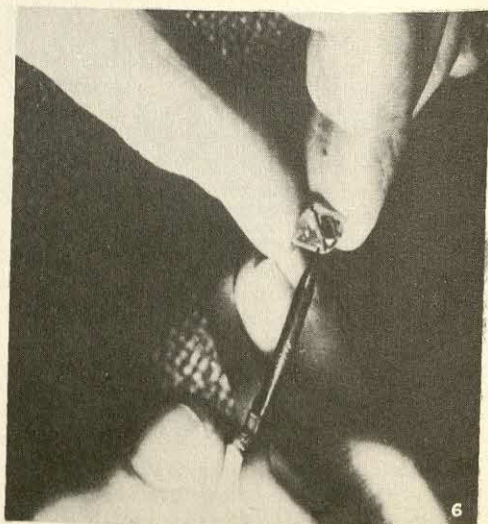
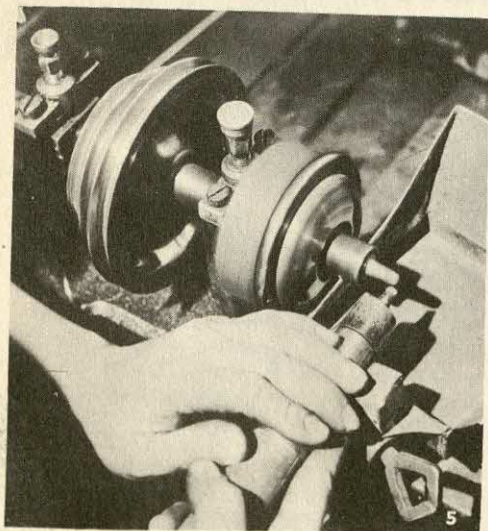
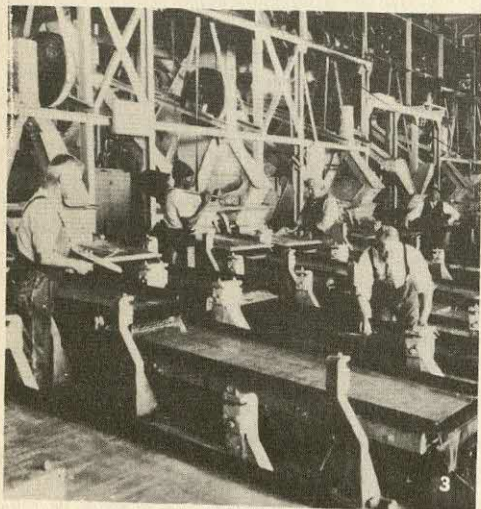
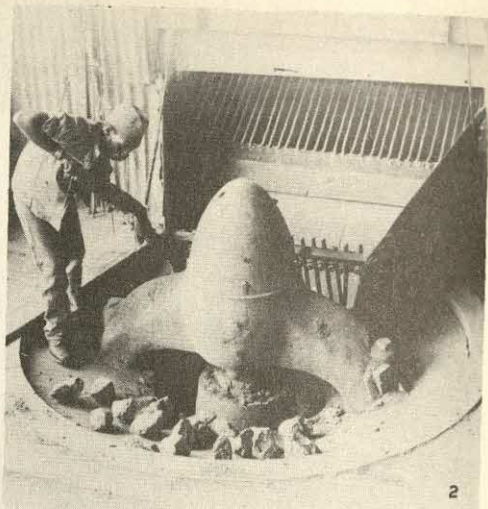
in crystallized forms, often in the isometric system. Frequently they appear in the shape of octahedrons with rounded edges, although they may have from three to six faces. Diamonds of the finest quality are colorless, perfectly clear, and said to be of the *first water*. Some varieties are green, orange, red, yellow, or blue; these are highly prized, if the tint is decided and equal throughout. The stone is transparent and translucent, and is so hard that it can be cut only by itself, and will scratch any other substance. When cut and polished, a diamond of the purest water weighing one carat is valued at about \$1,250, retail. The value increases as the square of the weight in carats is multiplied. Its commercial value is affected by the slightest tinge of color, though blue-colored diamonds are exceedingly rare and have commanded high prices.

The annual production of diamonds in South Africa, including stones of both gem and industrial quality, is about 1,200,000 metric carats, although the output varies greatly from year to year. Other productive diamond fields are located in other parts of Africa, and in Brazil, Venezuela, and British Guiana. The diamond fields of Brazil were discovered in 1728, and the largest single specimen found there weighed 254 carats. It was sold to the Gaekwar of Baroda for \$400,000, and became known as the Star of the South.

Diamonds are found in the sand and gravel of river, lake, and sea beds, and in diamond-bearing rocks. The stones are separated from the sand and rock by washing; this requires elaborate machinery and a large water supply. The principal uses of diamonds are for polished gems, ornaments, cutting glass, and boring or drilling. Engravers use diamonds as etching points, for which purpose they are cut in various forms.

Among the diamonds celebrated in history is the Great Mogul, found in 1550, in Golconda, which weighed 793 carats and was cut to 279 carats. The Austrian is a rose-cut diamond weighing 140 carats. The great diamond in the scepter of Russia weighed 193 carats. It was purchased by Count Orloff for \$500,000 and presented to Empress Catherine II on her birthday in 1772. The Kohinoor, meaning Mountain of Light, belonged in turn to Shah Jehan, Aurungzebe, Nadir Shah, the Afghan rulers, and afterward to the East Indian Sikh chief, Runjeet Singh. It was given to Queen Victoria of England in 1849 by the last ruler of the Punjab, when the annexation of his dominions to Britain took place. Originally it weighed 800 carats, but was reduced by unskillful artists to 279 carats. It was recut in 1852 and now weighs 103 carats. The Regent or Pitt diamond, now in the Louvre, Paris, weighs 136 carats. The Cullinan, the world's largest diamond, found in 1905 in the Transvaal, weighed 3,106 carats. It was cut into 105 diamonds, including the Star of South Africa (530.2 carats), and Cullinan II (317.4 carats). The Jonker diamond, found in South Africa, weighed 516.5 carats, and was cut into twelve diamonds (1936). The Hope diamond, originally weighing 112½ carats and cut (1830) to a 44½ carat gem, was found in India. For a time part of the French crown jewels, it passed into American hands in 1911.

Diamond imports (uncut stones) into the U.S. averaged, for the two years 1947 and 1948, \$43,524,978 annually, or an annual average of \$45.72 per carat. Imports of cut gem diamonds into this country in 1948 had a total value of \$56,244,923. Production in the U.S. is negligible, though diamond mines exist in Arizona and California. Diamond cutting has made greater strides in the



DIAMOND-BIRD

U.S. since the advent of World War II, with the immigration of Dutch cutters to the U.S.

See also the accompanying illustrations and the color plate, *Precious Stones*, in Vol. IX.

Diamond-bird (*bûrd*), a small Australian bird of the genus *Pardalotus*. Generally gray or white in color, it is spotted with red, yellow, orange, or white markings. It nests in old tree trunks, although it will sometimes burrow in the ground or use a small hole for a nest. It feeds on insects. The popular name, Diamond-bird, is derived from the diamond-like markings on its feathers.

Diamond Necklace (*dî'à-mônd nêk'lâs*), AFFAIR OF THE, a mysterious incident which occurred in the reign of Louis XVI of France and compromised his queen, Marie Antoinette. In the time of Louis XV, the Parisian jewelers, Boehmer & Bassinge, tried without success to

1. BLUE GROUND

Cars carrying blue ground from the mine to the nearby plants contain, on the average, less than one-quarter of a carat of diamonds

2. ROTARY CRUSHER

Breaking up the blue ground

3. SORTING DIAMONDS FROM CONCENTRATE

On grease covered sorting tables, the diamonds are separated from the last of the concentrate

4. ROUGH DIAMONDS

Diamonds, originally shaped in the form of an octahedron (eight-sided figure on which each face is a triangle), often have a clouded surface and reveal their clarity only after cutting has begun

5. ROUNDING

To round off the rough diamond, it is cemented in a holder placed at the hub of a revolving wheel and ground against another diamond mounted at the end of a long stick

6. MARKING

Each rough diamond is marked with a fine steel pen and India ink to indicate the line through which it should be cut

7. SAWING

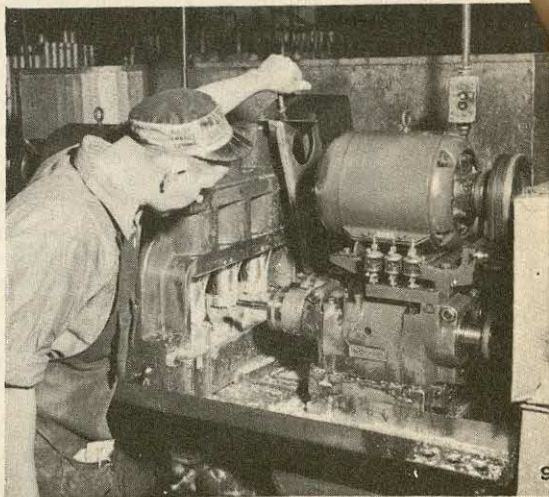
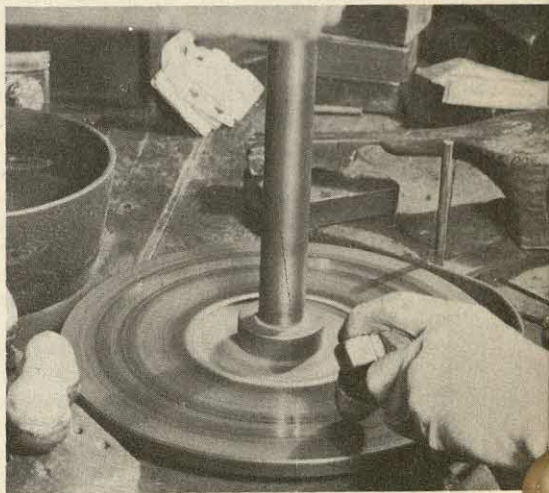
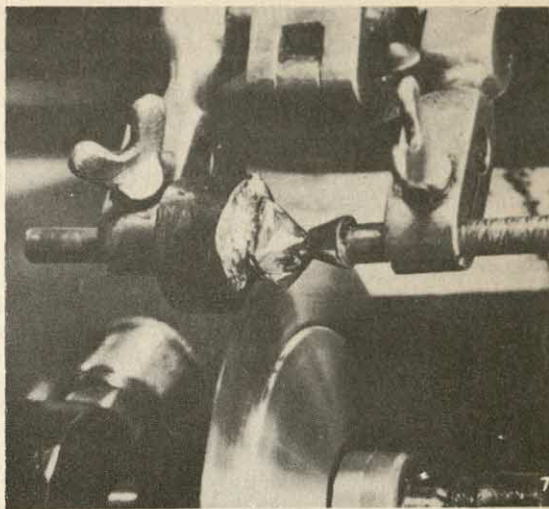
A circular blade of phosphor-bronze, impregnated with oil and diamond dust, saws the diamond along the line previously marked

8. FACETING

To polish the facets which give the stone its brilliance, the diamond (set in molten lead) is held against an iron disc coated with diamond dust in an oil mixture, spinning at about 2,000 revolutions per minute. There are 58 facets on the popular brilliant-cut diamond and the stone must be placed accurately at a different angle for each facet

9. INDUSTRIAL DIAMONDS

The diamond cutting point on the end of this steel tool bores pin holes in automobile pistons, leaving a smooth finish and a close tolerance which could not be achieved with any other tool



sell a collection of fine diamonds, set as a necklace, for Madame du Barry, the king's favorite. As the necklace remained unsold after the accession of Louis XVI, the jewelers anxiously suggested on several occasions (1778-84) that the new king purchase it as a present for Queen Marie Antoinette.

The jewelers bided their time until 1784 when they were led to believe that a certain adventuress, Jeanne de St. Remy, wife of the so-called Count of Lamotte, was on intimate terms with the queen. The countess had, in fact, persuaded all of Paris that she enjoyed the confidence of Marie Antoinette. As the mistress of Cardinal Louis de Rohan, the countess had taken advantage of the cardinal's great desire to reinstate himself in the good graces of the queen and arranged a fake correspondence between the queen and the cardinal, implying that the queen was secretly in love with him. At a masquerade meeting staged in the gardens of Versailles the alleged queen accepted a rose from the cardinal, promising to forget the past. By this time, the countess was able to borrow money supposedly for the queen's charities, and the jewelers, who were still trying to sell the diamond necklace, felt safe. In approaching the countess with the idea that she should persuade the queen to purchase it. The countess made it known that the queen desired the necklace and produced the queen's supposed instructions of purchase. A willing intermediary was found in the person of the Cardinal de Rohan who negotiated with the jewelers, finally delivering the necklace to a valet whom he assumed to be in the service of the queen. Apparently, Marie Antoinette was informed directly of the negotiations by the jewelers, but, of course, she never received the diamond necklace, and when the bill was presented, she denied all knowledge of the negotiations. By this time, the Count of Lamotte, who had probably received the necklace in the guise of the queen's valet, was trying to sell it in London.

The storm burst on Assumption Day, Aug. 15, 1785. The cardinal was arrested as he was preparing to officiate at the royal chapel services, and several days later the countess and her accomplices were also arrested and imprisoned. At the trial of May 31, 1786, the queen and the cardinal were declared innocent, but the latter was disgraced and relieved of his charge. The countess was condemned to be whipped, branded, and imprisoned in the Salpêtrière, but she later escaped to write memoirs in which she accused the queen. The count was condemned in absentia to the galleys for life.

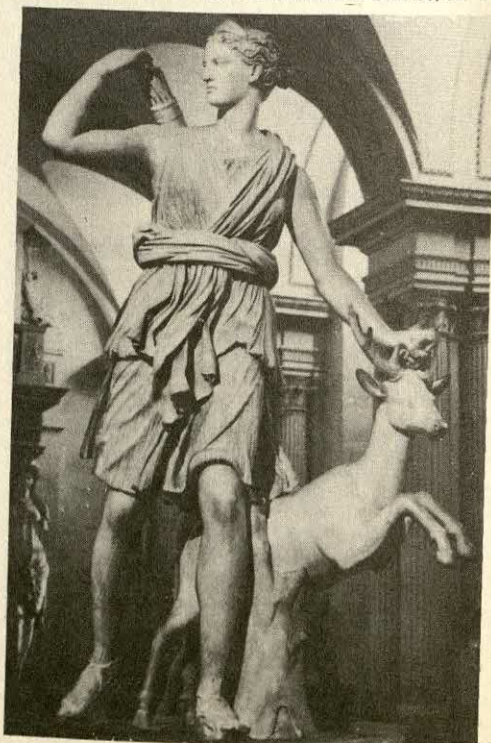
As all papers and correspondence concerning this incident were destroyed, a great deal of mystery surrounds it. It is thought that the queen and the cardinal were mere dupes in the intrigue,

but since the queen's hatred of the cardinal was well known, rumors circulated to the effect that the queen had used the countess to take revenge on the cardinal.

Diana (*dī-ă-nā*), a goddess of the Romans, known among the Greeks as Artemis. She was the daughter of Zeus and Leto, the twin sister of Apollo, and the goddess of hunting and chastity, but is sometimes represented as goddess of the moon. Being skillful with the bow, she was able to deal out death and sudden destruction to men and animals, while her amiable disposition caused her to alleviate suffering and to care for the diseased. In statuary she appears as a youthful and slender maiden, her hair gathered in a knot at the back of her well-shaped head, and a figure most graceful in proportions and attitude. The free use of her limbs is allowed for hunting by a short robe, and the bow and quiver bear evidence of her devotion to the chase. The most celebrated statue is that known as the Diana of Versailles, preserved in the Louvre, which was found near Tivoli, and forms a worthy companion to the Apollo Belvedere of the Vatican. In this statue the goddess appears in the act of rescuing a deer from its pursuers and turning to the latter with an angry mien. With one hand

DIANA

Courtesy French Press & Information Service, N. Y.



she draws an arrow from the quiver, while the other is laid protectingly on the head of the stag.

Diana, TEMPLE OF, a famous temple at Ephesus (*q.v.*), in Asia Minor, one of the Seven Wonders of the World. Designed by Chersiphron of Cnossus, the building was 225 ft. wide and 425 ft. long, adorned with 126 columns of Parian marble, 60 ft. high. After various other depredations, it was sacked by the Goths in A.D. 262 and was not rediscovered until 1869.

Diaphragm (*dī'ā-frām*), the broad, almost circular muscle which separates the cavity of the thorax from that of the abdomen. It is thin and in its center has some fibrous tissue. Because of the constant pressure, of the abdominal viscera and muscles, it arches up in the thorax. Through it pass the esophagus, aorta, thoracic duct, inferior vena cava, and a number of the large nerves. During inspiration it descends, thus increasing the capacity of the thorax, whose vacuum is filled with air, and in expiration it assumes its former position. Expulsions of air are governed largely by the diaphragm, hence it is a factor in laughing, crying, sneezing, and coughing. Sudden contractions of the diaphragm cause hiccupping.

Diarbekir (*dē-är-bē-kēr'*) or DIYARBAKIR, a city in southeastern Turkey, capital of a province of the same name, on one of the headwaters of the Tigris River. It is an ancient trading center, served now by highway, rail, and river traffic. The manufactures consist chiefly of silk and cotton textiles and utensils made from copper, mined nearby. There are several interesting bazaars, mosques, and Christian churches. Constantine fortified it, but it was captured by the Persians in A.D. 502. Population, *ca.* 45,000.

Diarrhea (*dī-q-rē'g*), in medicine, a condition characterized by frequent fluid discharges from the bowels. It may be acute or chronic, and the severity and duration may vary. The symptoms include nausea, vomiting (*qq.v.*), and abdominal cramps. It may be caused by infections of the intestines (*e.g.*, bacillary dysentery), colitis, cholera, and typhoid fever (*qq.v.*). Food poisonings, food allergies, and the abuse of cathartics, as well as emotional disturbances such as fear or grief, may bring on an attack. Diarrhea is often one of the symptoms of a general infection, such as measles (*q.v.*), or an over-active thyroid (*q.v.*). Recurrent or persistent diarrhea may be seen in tuberculosis and cancer. Acute diarrhea may subside of itself; bed rest and abstinence from food hasten recovery.

Infantile diarrhea (summer complaint), once one of the three leading causes of death in infants under one year, has been markedly reduced, largely by the pasteurization and sanitary handling of milk.

Dias (*dē'qsh*) or DIAZ, BARTHOLOMEU, Portu-

guese navigator, born *ca.* 1445; lost at sea in a storm, May 29, 1500. Of noble birth, he became a member of the royal household of King John II (*q.v.*). He interested himself in exploration and discovery and in 1486 went on a voyage along the west coast of Africa. Two years later, sailing farther south, he discovered the Cape of Good Hope. In 1500 he went on a voyage of exploration with Pedro Cabral (*q.v.*), the discoverer of Brazil, but was shipwrecked on the way back.

Diaspora (*dī-ās'pō-rā*), Greek term meaning dispersion of a tribe or people among other races or other beliefs. It has been used for many such cases in history, but in its narrower sense it signifies the dispersion of the Jews outside of Palestine. The oldest diaspora was the exile in Babylon and later in Egypt and other centers of Graeco-Roman civilization. The dispersion of the Jews in our time is also called diaspora.

Diathermy (*dī'q-thēr-mī*) or DIATHERMIA. See *Electricity, Medical Use of*.

Diatoms (*dī'q-tōmz*), a group of thousands of one-celled aquatic plants, in the larger group known as algae (*q.v.*). Each diatom consists of a living cell, containing chlorophyll and a yellow pigment, enclosed in a double shell of clear silica. Diatoms occur in many shapes, round or elongated. Some can move slowly; some grow attached side by side in strings. The shells are often finely sculptured.

Diatoms are abundant in fresh and salt water. In the cooler oceans, they occur in such vast numbers as to constitute the "pastures" of the sea, basic food for all animal life. In fresh water, a few kinds may give an off taste or odor to drinking water.

Because their shells are indestructible, they form great deposits in ocean depths. Fossil beds known as *diatomaceous earth*, miles wide, provide basic material for scouring powders and also the substance in which nitroglycerine is soaked to make dynamite (*q.v.*). See also *Kieselguhr*.

Díaz (*dē'äs*), PORFIRIO, statesman and general, born in Oaxaca, Mexico, Sept. 15, 1830; died in Paris, France, July 2, 1915. He studied law, but soon joined the Mexican army, in which he fought with distinction against the U.S. As military governor of the state of Vera Cruz (1863-76), he reformed the civil service and suppressed several insurrections. He fought against the French invasion and led the forces that overthrew Maximilian in 1867. With the re-establishment of the republic in 1867, Benito Juárez (*q.v.*) was elected president, but soon died and was succeeded by Lerdo de Tejada. In a revolution, Díaz ousted the latter and was proclaimed president by the congress; he served from May 5, 1877, to Nov. 30, 1880. His administration was distinguished by wholesome tariff and

financial legislation, and extensive internal improvements, particularly canal and railroad building. He was again elected president in 1884 and was re-elected successively, practically without opposition, and in 1904 was chosen president for the seventh time. His government was marked by a vigorous policy, civil service reform, commercial growth, and educational advancement, and was admirably suited to the needs and conditions of the republic. Under it the country witnessed marvelous prosperity, and the stability and credit of the nation became assured. He resigned as president in 1911.

Diazo Compounds (*dī-āz'ō*), a class of organic nitrogen compounds of great importance in synthetic chemistry, containing the group $-H=N-$, discovered by Peter Griess in 1858. They are produced by the action of nitrous acid in a cold acid solution of an amine. Diazo compounds easily undergo a variety of changes, though when prepared as dry salts are explosive. The solutions when boiled with water form phenols, and when treated with copper chloride form chlorine derivatives with liberation of the nitrogen. When a diazo compound is treated with a phenol or an amine, a dyestuff is produced. The number of amines and phenols available make it possible to produce a great variety of dyes, called the *azo dyes*.

Dice (*dīs*), the plural of die, small cubes of bone, ivory, or serpentine stone, used in playing the game of dice. The faces are marked with a different number of points, from one to six, in such a way that the numbers on any two opposite sides count seven. In playing they are shaken and thrown from a box on a table, and the game depends upon the number of points presented by the upper faces. It is thought that the game was first used by the Lydians, and it was played quite extensively among the Greeks, Egyptians, and Romans.

Dickens (*dīk'enz*), CHARLES, novelist, born at Landport, England, Feb. 7, 1812; died June 9, 1870. He was the son of John Dickens, who was employed in the navy pay department. When Charles was nine years old, his father became reduced to straitened circumstances and was required to live in one of the poorer districts of London, where he was troubled by his creditors. Charles received a somewhat scanty education, was placed in a blacking warehouse, where he did drudgery, and later became clerk in an attorney's office. After a time his father's circumstances became improved and he returned to school, perfecting himself in shorthand for the position of a newspaper reporter. His early engagements were with the *Mirror of Parliament* and the *True Sun*, and in 1835 with the *Morning Chronicle*, in which the first series of the "Sketches by Boz" brought him to public notice.

The following year his success was assured by the appearance of "Pickwick Papers," in which the humor and oddities of life are finely repre-



Courtesy British Information Services, N. Y.

CHARLES DICKENS

sented. Other works soon followed, among them "Oliver Twist," in which the conduct of work-houses was exposed. Soon after followed a denouncement of the cheap boarding schools in "Nicholas Nickleby," and later the weakness of home instruction in "Dombey and Son." After visiting America in 1842, his satirical accounts of American manners and life appeared in "Martin Chuzzlewit" and in "American Notes." Soon after, his "Christmas Tales" delighted and attracted the interest of large circles of readers.

Dickens visited Italy in 1845 and on his return assumed editorial management of the *Daily News*, which he soon after gave up to publish his "Pictures from Italy." He became editor of the *Household Words* in 1850, in which several of his works appeared as serials, among them "A Child's History of England." He ceased its publication in 1859 and started *All the Year Round*, a similar periodical, in which a number of productions appeared, among them "A Tale of Two Cities," "Great Expectations," "Uncommercial Traveler," and "Our Mutual Friend." The last of his works was issued in 1870, entitled "The Mystery of Edwin Drood," but only three numbers appeared before his death at his residence near Rochester. He was buried in Westminster Abbey.

Dickens' works have been read almost universally. His writings deal with life as found among the lower and middle classes of society in his

time. They are characterized by a constant flow of spirit, drollery, and pathos. He notices trifles that are unheeded by the ordinary observer and describes his characters so exquisitely that their names have become common phrases and household words. His readers are not confined to English-speaking people, but are found among other peoples into whose languages his works have been translated. The popularity of Dickens in America was shown in 1867 by the enthusiastic reception he received upon visiting the U.S. a second time. His works not mentioned above include "The Old Curiosity Shop," "The Personal History of David Copperfield," "Bleak House," "A Christmas Carol," "The Cricket on the Hearth," "The Battle of Life," "Barnaby Rudge," and "Little Dorrit."

Dickinson (*dīk'in-sōn*), county seat of Stark County, N.D., 104 m. w. of Bismarck. It is located on the Heart River and on the Northern Pacific R.R. The surrounding country is agricultural, with an emphasis on stock raising. There are large deposits of lignite, clay, and bentonites nearby. Dickinson is important as a shipping point for grain and livestock. Population, 1905, 3,188; in 1930, 5,025; in 1950, 7,469.

Dickinson College, a coeducational institution of higher learning at Carlisle, Pa., the second oldest in the state, founded in 1773. At first under Presbyterian control, it was transferred to the Methodist Episcopal Church in 1833. It has an endowment of *ca.* \$2,000,000, and the library contains about 85,000 volumes. The college provides courses in the liberal arts, sciences, and modern languages. There were about 1,000 students and 75 faculty members in 1950.

Dickinson, DANIEL STEVEN, politician, born in Goshen, Conn., Sept. 11, 1800; died April 2, 1866. He first worked as a clerk in a clothing store, later taught school, was admitted to the bar, and settled at Binghamton, N.Y., in 1831. A Democrat, he was appointed U.S. Senator in 1844; to fill a vacancy, and in 1861 was elected to the office of attorney general of New York State. Later he was district attorney for the southern district of New York and held other responsible positions. As a debater and orator he took high rank, supporting the conservative wing of his party.

Dickinson, DONALD McDONALD, known as DON M. DICKINSON, jurist and politician, born in Port Ontario, N.Y., Jan. 17, 1846; died Oct. 15, 1917. He moved with his family to Michigan when 12 years old, was educated in the public schools of Detroit and at the Univ. of Michigan, and was admitted to the bar in 1867. Achieving prominence as a lawyer, he entered politics in 1872 and took an active interest in Democratic affairs. President Cleveland appointed him Postmaster General in 1887. He resumed the practice of law

in Detroit at the expiration of his term. The Michigan legislature honored him by organizing a new county in 1891 and naming it for him.



Courtesy Brown Bros., N. Y.

EMILY DICKINSON

Dickinson, EMILY ELIZABETH, poet, born in Amherst, Mass., Dec. 10, 1830; died there, May 16, 1886. Socially a recluse, she began to write poetry about 1861, although she did not publish any of her poems. Of more than a thousand lyrics found after her death, a portion were published in 1890, and others subsequently. "Bolts of Melody" (1945) added some 600 more. Although of uneven merit, her poems have received increasing recognition. The delicate simplicity and startling freshness of her rhythms and imagery are unique; her intuitive flashes provide some of the finest expressions of New England mysticism.

Dickinson, JOHN, statesman, born in Talbot County, Maryland, Nov. 8, 1732; died in Wilmington, Del., Feb. 14, 1808. The son of a wealthy family, Dickinson was educated by private tutors before studying law in Philadelphia, Pa., and London, England. He was admitted to the bar in 1757. He was a member of the Delaware assembly in 1760 and that of Pennsylvania in 1762 and 1764 and was a delegate from Pennsylvania to the Stamp Act Congress in 1765. The declaration sent to the king from that congress was largely Dickinson's work. In it and in a pamphlet published in the same year, he developed his position on taxes and on the relations of the colonists with Parliament. He was sent to the Continental Congresses by Pennsylvania in 1774-76 and by Delaware in 1776-77 and 1779-80. Even after the battle of Bunker Hill, he continued to align himself with those who attempted to reconcile the colonists and the crown, rejecting independence but refusing to recognize the rights to tax claimed by Parliament. Nevertheless, his

own "Letters from a Farmer in Pennsylvania to the Inhabitants of the British Colonies" brought to a focus the issues which culminated in the Revolution. Directed against the Townshend Acts of 1767, they were published first in the *Pennsylvania Chronicle* (1767-68) and later in pamphlet form. See *American Revolution*.

Dickinson did not sign the Declaration of Independence and absented himself from the meeting (July 2, 1776) called to vote upon it. He was, however, head of the congressional committee which prepared the Articles of Confederation (q.v.), and he was one of two members of Congress to take up arms. He was president (governor) of Delaware in 1781 and of Pennsylvania in 1782-85. As a delegate from Delaware, he was chairman of the Annapolis Convention in 1786 and a member of the Constitutional Convention of 1787. He signed the Constitution and urged its ratification in a series of letters signed *Fabius*. Dickinson Coll. (q.v.) was named for him.

Dickinson, ROBERT LATOU, gynecologist and sexologist, born in Jersey City, N.J., Feb. 21, 1861; died at Amherst, Mass., Nov. 29, 1950. After studying in Switzerland and Germany, he received his M.D. from the Long Island Coll. Hospital (1882). At the outbreak of World War I, he went to Washington as assistant chief of the National Defense Council's medical section. In 1918 as a lieutenant colonel, he became medical adviser and member of the general staff, and the following year was sent to China on a mission for the Public Health Service. He then returned to private practice, teaching at Long Island Coll. Hospital and writing. Author of many books and articles on obstetrics, diseases of women, hospital organization, and sex problems, he also illustrated his own writings. With A. Belskie, he did the sculpturing of obstetric models for the birth series at the New York World's Fair in 1939. He later served as senior gynecologist and obstetrician at Brooklyn Hospital, New York. He was a strong advocate of planned parenthood and euthanasia.

Dicoumarin (di-kōō'mā-rin), a substance which will slow or prevent the clotting of blood. It is a derivative of coumarin (q.v.). See *Heparin*.

Dictator (dik-tā'tēr), the highest magistrate in the ancient Roman Republic. The dictator was an extraordinary magistrate, endowed with absolute authority, and appointed to serve in a time of crisis. A dictator was nominated by a consul upon the suggestion of the senate. The first dictator was appointed in 501 B.C., nine years after the Tarquins were expelled from Rome. Only those who had previously been consuls were eligible for the position. Originally the office could be filled only by a patrician, but later eligibility was extended to the plebeians. No one could legally hold the office longer than six

months, but Sulla and Caesar were dictators for a longer period. The dictator had absolute power without any appeal, and his official acts could not be questioned by the senate. He was prohibited from leaving Italy, could not use the public funds, and was not permitted to ride on horseback without special permission from the people. In 44 B.C. Rome abolished the office.

With the beginning of the Middle Ages and the consolidation of royal power, dictator-like rulers selected from the people were superseded almost exclusively by rulers of noble birth. Modern history has seen the passage of absolute monarchy and the advent of more democratic forms, but the 20th century has produced a reversion to dictatorships in which power is held without reference to royal descent.

Dictionary (dik'shūn-ēr-yē), a book containing a selection of the words of a language (or certain classes of them, as dialect, slang, etc.) arranged in a stated order, usually alphabetical, and giving information about their meaning, pronunciation, spelling, origin, idiomatic use, or other significant facts. Dictionaries either give the meanings of words in one language in the words of another, as in an English-French dictionary, or in other words of the same language, as in an English dictionary. The term dictionary is also frequently extended, however, to include any reference book arranging information in alphabetical order, as a biographical dictionary or a dictionary of quotations.

The compilers of the first English glossaries sought to assist students of foreign languages. However, because of the many new words that came into the English language during the Renaissance, a need arose for dictionaries that confined themselves to the explanation of difficult English terms. The first English dictionary, "A Table Alphabeticall" by Robert Cawdrey (1604), contained some 3,000 such words. In 1702 appeared "A New English Dictionary" by one J. K. (probably John Kersey) of some 28,000 words, and this was the first English dictionary to include common words. During the 18th century dictionaries were looked upon as the arbiters of good usage; in Samuel Johnson's "Dictionary of the English Language" (1755) care was taken to define all words with precision and to give numerous quotations from the best authors in an effort to standardize the language. Noah Webster, in "An American Dictionary of the English Language" (1828), asserted American independence of the British literary tradition and introduced many simplified spellings. The lineal descendant of the original Webster dictionary is issued at present as "Webster's New International Dictionary of the English Language" (1935); however, the name "Webster" has been applied to a number of dictionaries issued by various publishers.

The spread of the scientific study of language in the latter part of the 19th century led to the making of the great "Oxford English Dictionary" (1884-1928), a complete historical record, so far as possible, of the words in the English vocabulary from the earliest records to the present day. "The Century Dictionary" (1889) was the first descriptive dictionary of English to be edited by a linguist, William Dwight Whitney. Edward L. Thorndike, the psychologist, continued the scientific tradition in dictionary-making, but adapted the presentation of information to the probable needs of the user, and thus improved greatly the understandability and usability of the dictionary.

The greatest contribution to historical lexicography thus far to be produced in the U.S. is the recently published "Dictionary of Americanisms" (1951), by M. M. Mathews. In the 350 years of their history English dictionaries have progressed from a book containing an arbitrary selection of words, with rudimentary definitions edited by an amateur, to reference books made by skilled editors with the help of many specialists that give, with the greatest possible objectivity, the facts about the use of words.

The Funk & Wagnalls "New Standard Dictionary of the English Language" (1913, originally published in 1894); the "American College Dictionary" (1947), and the "Thorndike-Barnhart Comprehensive Desk Dictionary" (1951) are counted among the best-known American dictionaries. The most extensive German work in the field is that of Wilhelm Grimm, and in the French language that of Emile Littré. Today the German standard work is the "*Grosse Duden*," and the most widely distributed French dictionary is the Larousse.

The first known dictionary was a Babylonian clay tablet with cuneiform characters, found in Nineveh in the 8th century B.C. See also *Encyclopedia*.

Didache (*dīd'á-kē*), in Christian theology, one of the oldest documents of the Church written in Greek. It was discovered in 1873 in the monastery of the Holy Sepulchre in Istanbul. Its main content is the definition of "Two Ways," the way of life and way of death, the former being devotion to the teachings of Christ and the latter, paganism. The document also defines the rites of baptism and of communion and other ceremonial practices. It was used in instruction for converts.

Diderot (*dēd-rō'*), DENIS, writer and philosopher, born in Champagne, France, Oct. 15, 1713; died July 30, 1784. He was educated for the ministry at the college of his native town. Later he studied at Paris, and, having a dislike for the ministry, tried the law, but, finding that ungenial, he devoted himself to literature. His allowance was cut off by his father because of his

refusal to become a lawyer or physician, and, reduced to financial straits, he sought employment as a tutor and writer for booksellers. Among his first works was a translation of the "History of Greece," which brought him the sum of \$120. Soon after, numerous works appeared that were objectionable to the clergy and the government, resulting in his imprisonment for some time at Vincennes. After regaining his liberty, he wrote for the stage, but his productions proved failures. He united with D'Alembert in editing the famous first French encyclopedia (*q.v.*). Originally, his intention was to prepare it as a translation of foreign works, but later he enlarged it as an original production.

The work on the encyclopedia occupied the attention of Diderot nearly 30 years. It was, because of the special fitness and excellent education of the author, a literary production of decisive value and completeness, although it met with considerable opposition among the ruling classes, who considered a number of the articles atheistic. In later life Diderot was pressed for money and determined to sell his library in order to provide for his only daughter. Empress Catherine of Russia, having heard of his intention, bought the library with the condition that the author himself should be librarian and receive an



DENIS DIDEROT

annual salary. Soon after, he proceeded to St. Petersburg to thank his benefactress, and returned to France in 1774.

The spiritual life of France during the 18th century was influenced greatly by the encyclopedia, which must be considered as essentially the work of Diderot. The movement of French enlightenment was an outgrowth of the encyclopedia.

The Church considered his writings atheistic, but they were actually deistic. Later in his life,

after publication of the encyclopedia, Diderot began to doubt the ideas of deism (*q.v.*). It must, however, be emphasized that he was not an atheist in the strict sense of the word, but denied only the concept of a personal God.

Diderot himself wrote the articles referring to techniques and crafts for the encyclopedia, as well as many articles on philosophy, chemistry, and physics. He was also interested in the theater, figurative art, music, theology, and natural science. His universal knowledge enabled him to write articles on various subjects when contributors to the encyclopedia failed to send in their essays.

Diderot also wrote plays intended as examples of a freer concept of the drama in contrast to the strict classical French tradition. Like the dramas of his German contemporary and translator, Lessing (*q.v.*), Diderot's plays are more notable for the ideas they expressed than for their poetic beauty.

His novels, "*Le neveu de Rameau*" and "*La religieuse*," caused a stir, especially the latter because of its almost pornographic naturalism.

Dido (*dī'dō*), the traditional founder of Carthage, who flourished about 880 B.C. She was the daughter of the King of Tyre, sister of Pygmalion, and wife of her uncle, Sychaeus. Soon after her brother ascended the throne of Tyre, he murdered Dido's husband, who was a priest of Hercules. Dido escaped with the treasures of Sychaeus, and, accompanied by many Tyrians, landed near the Phoenician colony of Utica in Africa, and built a citadel called Byrsa on a site bought from the Numidian king. The story is told that she purchased a tract of land that could be encompassed with the hide of a bull, and, after the agreement, she cut the hide into small strips and surrounded a large tract of ground, on which the mighty city of Carthage was built. Her death, described as self-immolation upon a pyre, has been assigned by Virgil, in the "*Aeneid*," to the fact that Aeneas deserted her and sailed to Italy, thus leaving her broken hearted. However, it is generally thought that Dido founded Carthage fully 75 years before the founding of Rome.

Didymium (*dī-dīm'i-ŭm*), a metallic element discovered by Carl Gustav Mosander in 1842, found chiefly in the mineral cerite. It is closely related to bismuth. Its chemical symbol is Di, and its atomic weight is 145.4. Chemists have separated it into two elements, *neodymium* and *praseodymium*.

Dieffenbach (*dē'fən-bāk*), JOHANN FRIEDRICH, surgeon, born at Königsberg, Germany, Feb. 1, 1794; died in Berlin, Nov. 11, 1847. His methods of treating squinting and stammering came into extensive use. Among his publications were "*The Treatment of the Stammerers*" and "*The Transfusion of Blood Into the Veins*."

Dielectric (*dī-ē-lēk'trik*), in electricity, an insulating material capable of being subjected to electric stress.

Dieppe (*dī-ēp'*), a northern French seaport in the department of Seine-Inférieure, at the mouth of the river Arques, on the English Channel, 38 m. N. of Rouen. In the 12th century it was exchanged by Richard I of England for lands near Rouen. The English plundered it in 1339 and held it between 1420 and 1435. In the 19th century it became a fashionable watering place, and in 1870-71 was occupied by the Germans. The harbor is one of the safest and deepest on the Channel. Shipbuilding and repair, oil refining, and the manufacture of machinery, rope, porcelain, and ivory products are important. On Aug. 19, 1942, a costly attack was made by Allied forces on the German-held port. This attack, considered a rehearsal of the invasion of the continent, revealed important military secrets of Germany's "fortress Europe." Population, *ca.* 25,000.

Dieresis (*dī-ēr'ē-sis*), in grammar, the two points " " used over a vowel to indicate that the vowel thus marked is separately pronounced from the preceding vowel, *e.g.*, "Aïda."

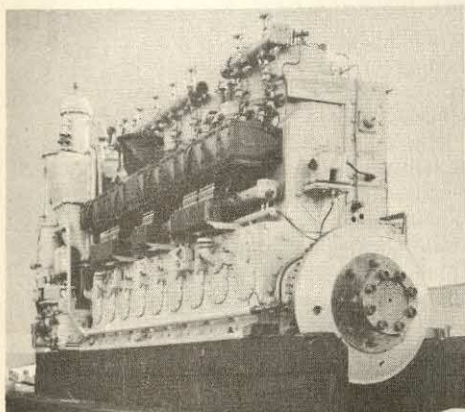
Diervilla (*dī-ēr-vil'ā*), a shrub (originating in China), of which certain species are popularly called Weigela or Weigelia. Two American species are named bush honeysuckle. The northern type, found in northern and central North America, grows 1 to 4 ft. high, has yellowish-white, pink, or crimson flowers and oblong leaves. The southern species is found in the Alleghenies.

Dies (*dīz*), MARTIN, Congressman, born in Colorado, Tex., Nov. 5, 1901. A law graduate of National Univ., Washington, D.C., he was a member (Democrat) of the U.S. House of Representatives, 1931-45, and chairman of the so-called Dies Committee established in 1938 to investigate un-American activities in the U.S. Dies was again elected to Congress in 1952, when he became Representative-at-large from Texas.

Diesel Engine (*dē'zəl ēn'jīn*), an internal-combustion engine (*q.v.*) burning fuel oil; invented by the German scientist, Rudolf Diesel, in 1893. The diesel engine is a two- or four-cycle engine. During the first stroke of the piston air is drawn into the cylinder and is highly compressed in the next stroke. The compression of the air raises the temperature to a point sufficient to ignite oil sprayed into the cylinder. During the third stroke the burned gases expand and produce the power, after which they are exhausted in the fourth stroke. Because the diesel engine uses heavy fuel oil (paraffinic gas oils, mostly derived from the direct distillation of crude petroleum) its operation is less costly than that of the gasoline engine. See also *Ignition*.

Diesel, RUDOLF, mechanical engineer, born in Paris, March 18, 1858; died by drowning, Sept.

29, 1913. The son of German parents, he was educated in Paris, then studied at the industrial school of Augsburg, Germany, and at the Acad. of Technology in Munich. In 1892 he received a patent for an internal-combustion engine, the so-called diesel engine (*q.v.*), and one year later he published "*Theorie und Konstruktion eines rationellen Warm-motors*," dealing with the theory and construction of a rational heat motor. In the following years, collaborating with Friedrich Krupp, of Essen, he developed his invention and in 1897 brought out his engine, now widely used and known by his name.



Courtesy Montreal Economic & Tourist Development Bureau

DIESEL ENGINE FOR MARINE POWER

Dies Irae (*dī'ēs ī'rē*), Latin, meaning "day of wrath"; the title given to a Latin sequence (hymn) whose first line is "*Dies irae, dies illa*." Its authorship is generally credited to Thomas of Celano (1200?-1255?), the friend and biographer of St. Francis of Assisi. The poem is dedicated to the Last Judgment, and was first published in Venice in 1250. No religious poem has undergone so many translations in various languages, owing to the difficulty in reproducing its exquisite religious fervor. Several stanzas were introduced by Sir Walter Scott into his "Lay of the Last Minstrel," the first of which is as follows:

The day of wrath! that dreadful day,
When heaven and earth shall pass away.
What power shall be the sinners' stay?
How shall he meet that dreadful day?

Diet (*dī'ēt*), the name of several political bodies of Europe, corresponding to the Parliament of Great Britain and the Cortes of Spain and Portugal. It is derived from the Latin *dieta*, and signifies a day fixed for the national deliberations of public affairs. In this sense it is used to designate the Reichstag of Germany, the Riksdag of Sweden, the Rigsdag of Denmark, and the Rijksdag of The Netherlands. The word *diet* is frequently applied by English writers to any

legislative assembly with the exception of the U.S. Congress.

Diet. See *Agriculture: FOOD AND NUTRITION*.

Dieterle (*dē'tēr-lē*), WILLIAM, motion-picture director, born in Ludwigshafen, Germany, July 15, 1893. After studying at Ludwigshafen, Heidelberg, Munich, and Zurich, Switzerland, Dieterle began his career as an actor in 1912, appearing on the stage in a number of German cities. He was acting in German motion pictures by 1921, and after two years took up directing. He came to the U.S. in 1930 as an actor, producer, and director, later forming his own corporation from which he resigned in 1942 to join another company. Among the pictures he has directed or produced are "Dispatch From Reuters," "Juarez," "The Life of Émile Zola," and "Portrait of Jenny."

Dieu et Mon Droit (*dīū ā mōn drwā*), French, meaning "God and my right"; the motto on the British coat of arms. It originated in the battle cry of Richard I (1157-99) at the battle of Gisors, 1198, when he wished to emphasize that he owed his power to God alone and was not subject to France. In 1340 Edward III (1312-77) revived these words in the Hundred Years' War against France.

Differential (*dīf-ēr-ēn'shal*), a mathematical quantity expressing variation of a function. It is equal to the product of the derivative of the function and an arbitrary increment of the variable. The differential of the function is written as the function preceded by the letter *d*. Equations involving differentials are solved by a process called *integration*, the summation of the differential by infinitesimal steps.

Differential Calculus (*ēāl'ēū-lūs*). See *Calculus*.

Differential Gear (*gēr*), a mechanism used to rotate the outer and inner wheels of an automobile at different speeds when rounding a curve. In turning, the outer wheels travel farther than the inner; on a dead (ungeared) axle, this results in wasteful and dangerous tire slippage. To avoid this slippage, the two ends of the automobile axle are mounted to the drive shaft by means of the differential gear which permits the outer wheel to turn faster than the inner. Thus both wheels complete the turn in the same time.

Diffraction (*dīf-frāk'shūn*), in physics, the deflection and decomposition of light, causing the appearances of parallel bands or fringes of prismatic colors. It occurs when light passes by the edges of opaque bodies or through narrow slits, as by the action of a grating of fine lines or bars. A glass screen, commonly called a *diffraction grating*, is used in physical laboratories to illustrate these phenomena. It consists of from 10,000 to 20,000 parallel lines to the square inch, ruled on glass, and as the light passes through brilliant spectrum colors result. A diffraction grating made

by ruling lines on speculum metal produces a similar effect by reflecting the light from the polished and ruled surface. Such gratings are used in place of the prism in spectroscopic work, and with them it is possible to obtain spectra of wide dispersion. The spectrum given by the grating is called the *normal spectrum*, since in it the distribution of the different wave lengths is uniform. Diffraction gives rise to the play of colors seen in mother-of-pearl and the feathers of some birds. See also *Light*.

Diffusion (*dif-fú-zhūn*), the process by which substances, in solid, liquid, or gaseous forms, intermingle uniformly or are transferred from one place to another. Diffusion results from the spontaneous motion of the individual molecules in the substance. A piece of camphor exposed to the air will gradually diffuse through the air until it disappears, as individual molecules leave the original piece of camphor. When wood is dried, the internal moisture in the wood diffuses to the surface where it finally evaporates (diffuses) into the air. If a gas, such as illuminating gas, is released, it diffuses uniformly through the air of a room. The rate of diffusion depends upon the molecular weight of the substance. Thus substances of light molecular weight diffuse most rapidly. According to Graham's Law, "Under similar conditions of temperature (and pressure), gases diffuse at a rate which is inversely proportional to the square roots of their respective densities, *i.e.*, their molecular weights." The rate of diffusion is affected by temperature, because molecular motion is increased by a rise in temperature.

Osmosis, the process by which water moves through a semipermeable membrane into a more concentrated solution, is sometimes referred to as a form of diffusion.

Digestion (*dī-jēs'chūn*), the process by which foods are converted into soluble products capable of being absorbed by the blood. It may be said to begin in the mouth, where food is masticated by the teeth, moistened with saliva, mixed with air and saliva, and formed into a bolus (rounded mass) for swallowing. The saliva, by its active principle known as *ptyalin*, changes some of the starch at once into sugar. The food is then pushed by the tongue into the pharynx, an opening at the back of the mouth, where the muscles of the pharynx contract and push the food into the esophagus or throat, and downward into the stomach. The glands of the stomach are excited to activity by the entrance of food, which has been made somewhat alkaline by the saliva and mucus, and the presence of acid lessens or stops the action of the ptyalin. A slight churning process in the stomach thoroughly mixes the ingredients, which are subjected to the action of pepsin, the active principle of the gastric juice. The

starches and fats are loosened, the protoplasm is dissolved, and the proteins are converted into peptones. Food is acted upon in the stomach in from three to four hours, depending upon its quality and quantity, as well as upon the individual's mental condition and physical health, both of which exercise a marked influence upon digestion.

The partly digested food which passes from the stomach through the pylorus into the duodenum is known as *chyme*, and is a grayish liquid mixed somewhat with large lumps. By the action of the bile, the pancreatic juice, and the intestinal secretions, in the small intestines, the starches are converted into sugar and the remaining proteins are converted into peptones, and the fats are made into an emulsion, or soapy substance. The digested food, known as *chyle*, is absorbed by the portal blood vessels and by the lacteals. When digestion of the food is nearly completed in the small intestine, the residue moves into the large intestine, or colon, through which it leaves the body. The contents that pass into the large intestine again become acids, owing to fermentation, and a small amount of cellulose is digested. See also *Metabolism*.

Dighton Rock (*dī'tūn*), a large boulder on the east bank of the Taunton River, opposite Dighton, Mass. It is remarkable for a deeply cut inscription in untranslated characters. Samuel Danforth studied it as early as 1680, and it was mentioned some 10 years later by Cotton Mather (*q.v.*), who in 1712 sent a woodcut of the entire inscription to the Royal Society. Some ethnologists have felt that the inscription may have been made by Norsemen about the year 1008, but most now believe it to have been of Indian origin.

Digit (*dī'it*), from the Latin *digitus* (finger, or toe), term originally signifying the 10 symbols of the Arabic numerical system. It is generally applied to the numerals from 1 through 9 and 0. It is used in ancient Hebrew as a linear measure of one finger-breadth, which corresponds to about $\frac{3}{4}$ in. See *Arithmetic*.

Dijon (*dē-zhōn'*), the capital of the department of Côte-d'Or, France, on a plain (alt. 246 ft.) near Mont Afrique, 1,915 ft. above sea level. It is on the main Paris-Lyon railway line, and is an important commercial and military center (eight forts). Burgundy wine and mustard are its outstanding products. Its churches include the Gothic St.-Bénigne, Notre-Dame, in typical Burgundian original style, and St.-Michel, consecrated in 1529. On the grounds of the famous Carthusian monastery Chartreuse de Champmol (founded in 1283, destroyed in 1793) is the famous "Fountain of Roses," a masterwork by the 15th-century Dutch sculptor Claus Sluter. The city hall, begun in 1336, was once a palace of the Burgundian dukes. The city has an excellent

museum. The Romans knew the city as Divio or Dibio. It passed from Burgundy to France in the 5th century, was ruled by counts in the 9th century, and was united to the duchy of Burgundy in 1015. After the death (1477) of Charles the Bold, it became a French city. Population, 1946, 100,664; in 1954, 112,844.

Dike (*dik*), in geology, an igneous rock which traverses other rocks, having been introduced as melted matter. Dikes commonly have a linear extent much greater than their width, which may be nearly uniform for some distance. They frequently project above the surface like a wall when the rocks around them are softer. They cut across the structure of the invaded rocks and thus differ from intrusive sheets, which were introduced between the layers or beds of the invaded rock. Many dikes are composed of basaltic rock, but they may represent a wide variety of igneous rocks.

The more common use of the word dike refers to trenches dug in the earth for protective purposes; also to dams or embankments of earth used to protect lowlands subject to flooding, particularly the dikes of Holland. These dikes also serve to reclaim land for cultivation.

Diksmuide. See *Dixmuide*.

Dilke (*dilk*), SIR CHARLES WENTWORTH, traveler and statesman, born in London, England, Sept. 4, 1843; died there, Jan. 26, 1911. He studied at Cambridge and subsequently was admitted to the bar. He described his worldwide tours in "Greater Britain," published in 1868. As a Liberal member of Parliament (1868-86), he sponsored social legislation, although he was a militant imperialist. He was under secretary of foreign affairs (1880-82) and held a seat in Gladstone's cabinet (1882-85). He lost re-election to Parliament in 1886 because of his involvement in a divorce case. Although he was re-elected in 1892, his public influence had waned by this time; nevertheless, he retained his recognition as a foreign policy expert and military critic.

Dillon (*dil'un*), C(LARENCE) DOUGLAS, financier, government official, born in Geneva, Switzerland, of American parents, Aug. 21, 1909. After he was graduated from Harvard Univ. (1931), he joined his father's investment banking house (Dillon, Read & Co.) and was vice president and director (1938-53). Simultaneously, he served with other securities corporations. He then entered U.S. government service and was ambassador to France (1953-57) and Under Secretary of State for economic affairs (1958-60). In 1961 he became Secretary of the Treasury.

Dillon, JOHN, politician, born in Blackrock, Ireland, Sept. 4, 1851; died in London, England, Aug. 4, 1927. He was educated at the Catholic Univ. at Dublin, elected to Parliament in 1880, and became a strong supporter of the Parnell



JOE DI MAGGIO

lites. His strong endorsement of the National League plan that the Irish tenant farmers pay their rents to the League instead of to the landlord brought him into conflict with the authorities, and he was imprisoned for a time. He visited Australia and New Zealand (1889) in behalf of the Irish cause, and, forfeiting bail, took temporary refuge in the U.S. in 1890. He later opposed Charles Stewart Parnell (*q.v.*) and became chairman of the Irish National Federation in 1896. He continued to espouse the Irish struggle against British rule until his death.

Diluvium (*di-lu'vi-um*), the heterogeneous, unstratified deposits of glacial drift, composed of clay, sand, and gravel formed by the continental glaciers of the Great Ice Age or Pleistocene epoch. All sedimentary rocks found in the earth have been deposited in orderly fashion, in flat horizontal layers or strata, with the exception of glacial deposits, which are, in large part, heterogeneous. Early European geologists, familiar with the stratified sedimentary rocks and unfamiliar with the unstratified glacial deposits, considered the glacial deposits of abnormal or catastrophic origin and supposed they were formed by a widespread flood which they correlated with the Biblical flood of Noah. The term diluvium was coined to designate these supposed flood deposits, but present usage (confined largely to Europe) restricts it to heterogeneous glacial deposits.

Di Maggio (*di māj'io*), JOE (JOSEPH PAUL, JR.), baseball player, born in Martinez, Calif., Nov. 25, 1914. He sold newspapers as a boy. In 1932 he joined the San Francisco Seals as a shortstop. He signed with the New York Yankees in 1935 and remained as star outfielder with that

team throughout his professional career (1935-51, excepting a tour of Army duty, 1942-45). Di Maggio's batting ability won him frequent athletic awards. After retiring from baseball, he became a business executive. His autobiography, "Lucky to Be a Yankee," was published in 1946.

Dimension (*dī-mēn'shūn*), the powers of the fundamental units used in expressing physical quantities. Sir Isaac Newton (1642-1727), proposed a system of fundamental physical units consisting of mass, length, and time. Dimensional analysis relates all other units to these by simple algebraic steps. An example of this is speed, which has the dimension of length divided by time.

Diminishing Returns (*dī-mīn'ish-ing*), LAW OF, in economics, a principle, stating that after a certain point has been reached in the exploitation of an enterprise, additional exploitation will increase the production at a lower rate. The principle of diminishing returns rests upon the assumption that the method of exploitation is not altered. The principle is illustrated in the operation of a farm, for which additional seed, fertilizer, and cultivation will increase the yield up to a maximum, after which the addition of further resources (seed, etc.) will result in a decline in the total yield. Total physical returns begin to diminish when the addition of more resources tends to decrease the efficiency of the enterprise and thus causes a reduction in total production despite the additional resources. At this "point of diminishing returns" the rate of production increase has fallen to zero, and is becoming negative.

Dimitrov (*dī-mě'trōf*), GEORGI, premier of Bulgaria (1945-49), born in Radomira, Bulgaria, June 18, 1882; died near Moscow, July 2, 1949. A prominent member of Communist governing circles for more than 25 years, Dimitrov served as Secretary-General of the Comintern from 1935 until 1943. In this capacity he became the principal author of many popular front (*q.v.*) policies and was highly influential in the promotion of such fronts in various European countries.

Dinar (*dī-nār*'), a monetary unit of Iraq and Yugoslavia.

Dinaric Alps (*dē-nār'ik*), a mountain range in southwestern Austria, trending parallel to the coast of the Adriatic Sea. It forms a connecting line between the western extremity of the Balkan Range and Mt. Klech, at the southern extremity of the Julian Alps. The highest peak, Mt. Dinara, is 6,010 ft. above sea level.

Ding, J.N., pseudonym of J. NORWOOD DARLING (*nōr'wōōd dār'ling*), cartoonist, born in Norwood, Mich., Oct. 21, 1878; died in Des Moines, Iowa, Feb. 12, 1962. After a somewhat sketchy college career which began in 1894, Ding received his Ph.B. from Beloit Coll. in 1900.

During his years in college, he worked on various newspapers in the West. While working as a reporter for the Sioux City *Journal*, he made a courtroom sketch which pleased his city editor so much that he was asked to contribute a daily cartoon. Ding developed his skill without the aid of formal instruction, and achieved a style which earned him over a million dollars. In 1906 he moved to the Des Moines *Register*, and five years later his cartoons were nationally syndicated. He accepted a position with the New York *Globe* the same year, but two years later returned to Iowa and the *Register*. From 1917 to 1948 he was syndicated by the New York *Herald Tribune*, and also continued his work for the Des Moines *Register*. Ding received the Pulitzer Cartoon Award in 1924 and in 1943. Of his most famous cartoons one depicted the death of Buffalo Bill, another the death of President Theodore Roosevelt. Ding had an active interest in wildlife and its preservation and for a year (1934-35) served as chief of the U.S. Bureau of Biological Survey.

Dingley (*dīng'li*), NELSON, politician, born in Durham, Me., Feb. 15, 1832; died in Washington, D.C., Jan. 13, 1899. Editor and founder of the Lewiston (Me.) *Journal*, he served as governor of Maine (1874-75), and later as a member of the U.S. House of Representatives (1881-99). He was a champion of highly protective tariff laws, and sponsored the Dingley (tariff) Act (1897), which remained in effect until 1909.

Dingo (*dīng'gō*), the wild dog of Australia, thought to have originated from a breed of the domestic dog. It has a size and appearance somewhat resembling that of a wolf. The color ranges from pale brown to black, usually with tawny markings; the ears are erect, and the tail is bushy. In a wild state it utters a wolflike howl, but when domesticated and placed in company with other dogs it soon learns to bark. The Australians often domesticate the dingo and use it in hunting.

Dinosauria (*dī-nō-sō'ri-ā*), a scientific term used in the past to denote a large group of extinct reptiles, now surviving only in the popular word *dinosaur*. It is now known that the dinosaurs are divided into two distinct orders, the *Ornithischia* and the *Saurischia*. They first appeared in Triassic time, about 200,000,000 years ago, and became extinct at the end of Cretaceous time, about 60,000,000 years ago, long before man appeared on earth. The majority of the dinosaurs were bipedal, but a few returned to a quadrupedal gait. They ranged in size from about 3 ft. in length to the greatest known herbivore of all time, *Brachiosaurus*, which was more than 80 ft. long and probably weighed more than 50 tons. The largest land-living carnivore that ever lived, *Tyrannosaurus*, also belonged to this group. During their evolution many branches of the group evolved bizarre adaptations. The stegosaurs had

a double row of bony plates along their back for protection. The ceratopsians were armored by a hard frill on the back of their skulls and by horns. The semiaquatic trachodonts had webbed feet and a broad "duckbill" snout. The troodonts had battering-ram heads with more than 6 in. of solid bone covering their tiny brains. As far as can be told from their fossil remains, the dinosaurs lived in all the habitats of the world open to reptiles except the marine environments. Other reptiles, the ichthyosaurs, plesiosaurs, and mosasaurs, inhabited the seas of those times. At least some of the dinosaurs laid eggs, as indicated by the complete eggs found in Mongolia. It is surmised, since they were reptiles, that they were cold blooded. Their closest living reptilian relatives are the crocodiles, and the birds are structurally close to them. Many hypotheses have been advanced as to the cause of their extinction.

Recent discoveries have added much to the knowledge of dinosaurs. In 1941 Dr. C. C. Young of the Geological Survey of China discovered in the province of Yunnan a specimen that he described under the name of *Lufangosaurus*, which throws some light on the ancestry of the saurpods. More recently, in 1946, Dr. I. A. Efrenov led an expedition of Russian paleontologists to Outer Mongolia, where they made many interesting finds in the upper Cretaceous formations exposed there. In North America the most recent find was made by Dr. E. H. Colbert in New Mexico, where he and

his party uncovered several skeletons of *Coelophysis*, a small, primitive carnivore close to the ancestral dinosaur stock. Previously this form had been known only from isolated bones.

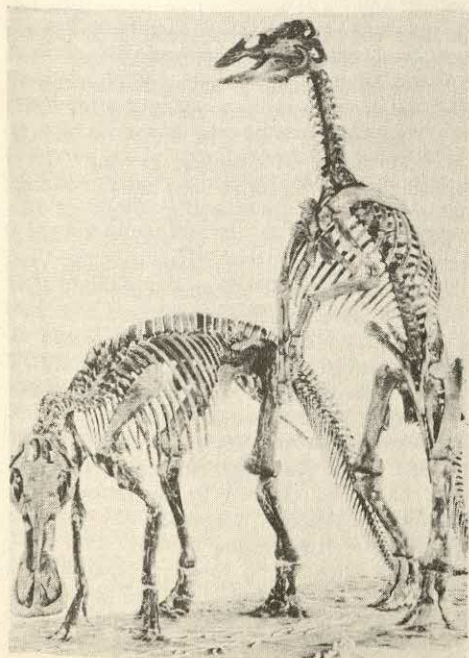
Dinotherium (*dī-nô-thē'rī-ūm*), a genus of extinct mammals allied to the modern elephant and the extinct mastodon. Fossil remains are found in the Miocene and Pliocene rocks of Europe. Animals of the genus *Dinotherium* had no tusks in the upper jaw, but two tusks projecting downward and slightly backward from the lower jaw. It is thought that these animals lived in southern Asia.

Dinwiddie (*dīn-wīd'dī*), ROBERT, colonial governor of Virginia, born in Scotland in 1693; died in Clifton, England, July 27, 1770. His appointment as lieutenant governor of Virginia in 1751 was due to his prompt exposure of frauds committed by the collector of customs in the West Indies. He proved to be a capable and energetic administrator, although he frequently quarreled with the colonial assemblies. In 1754 the danger of French troop installations in the Ohio region caused him to send forces under George Washington (*q.v.*) to protest the seizure of British property. He also supported the expedition of Edward Braddock (*q.v.*) in 1755, and after Braddock's death continued his efforts to protect the frontier from both French and Indians. Dinwiddie returned to England in 1758.

Diocese (*dī'ô-sēs*), in the administration of churches, a geographical district under the jurisdiction of a bishop. The term, introduced by Constantine the Great (A.D. 306-337), originally meant any sphere of authority or jurisdiction.

Diocletian (*dī-ô-klē'shan*), full name GAIUS AURELIUS VALERIUS DIOCLETIANUS, Emperor of Rome, born in Dalmatia in A.D. 245; died in 313. The son of a freedman, he joined the Roman army as a youth and rose rapidly to a position of power. Following the death of Emperor Numerian, Diocletian was proclaimed emperor by the troops in 284. After he defeated Numerian's brother Carinus in 286, his title was undisputed. Diocletian remained emperor until his abdication in 305, and during his reign initiated numerous political reforms. His principal action was to divide the empire into four administrative parts; three of these he delegated to subordinates directly under his command, the fourth he retained under his personal jurisdiction. The Roman senate, which previously had shared nominally in certain powers, was thereby reduced to the position of a local council; by this means Diocletian established the autocracy of the later Roman empire.

Dioecia (*dī-ē'shī-ā*), an obsolete classification of plants formulated by Carl von Linné (Linnaeus), including those having staminate and pistillate flowers on separate plants, meaning



Courtesy Am. Mus. of Natural History, N. Y.

that male and female organs are borne by different individual plants.

Diogenes of Sinope (*dī-ōg'ē-nēz of sīn'-ō-pē*), Greek philosopher, born in Asia Minor about 412 B.C.; died near Corinth about 323 B.C. He is not to be confused with Diogenes of Apollonia who lived before him, or with Diogenes of Babylon and Diogenes of Laërte, both of whom lived after him. Diogenes of Sinope was the son of a money changer, and the two having been detected in counterfeit coins were obliged to leave their native city. On his arrival in Athens, Diogenes became interested in the teachings of Antisthenes, the founder of Cynicism. In order to become a follower of this philosophical school, Diogenes discharged his single attendant and stripped himself of all superfluous possessions. It is told that he retained nothing but a cloak, a wallet, and a wooden bowl, the latter of which he threw away when he saw a boy drinking from the hollow of his hand. According to a popular story, he walked barefooted through the streets of Athens and at night slept in a large earthen tub belonging to the Temple of Cybele. During a voyage to Aegina, Diogenes was captured by pirates and sold in Crete as a slave. Taken to Corinth to superintend the education of his master's children, Diogenes soon became famous for his learning. At the Isthmian Games great crowds gathered to hear his words, and on one occasion he met Alexander. When that great man sought to reward him and asked what favor he might render, Diogenes' reply was that he would beg the prince not to stand between him and the sun. Alexander replied, "If I were not Alexander, I would be Diogenes."

Diogenes is one of the very few philosophers of whom more is known by anecdotes and words he uttered, or was supposed to have uttered, than by a fully developed system, as laid down by Plato and other great philosophers. All the more or less true stories about him prove Diogenes to have been a representative of the school of Cynicism (*q.v.*), which preached a doctrine of virtuous self-control and strict avoidance of pleasure. By denying material needs of food, shelter, and clothing to the body and abstaining from social contacts in the world, man frees his mind. This behavior was in some respects akin to Buddhism and the asceticism of the early Christians. See *Asceticism*.

Diomedes (*dī-ō-mē-dēz*), the son of Mars and Syrene, and King of the Bistones in Thrace. He is celebrated for his mares, which he fed upon human flesh. To obtain possession of these mares was one of the 12 labors of Hercules, who slew Diomedes and fed his body to the mares, after which they became docile. Another Diomedes, son of Tydeus, was a prominent figure in the Trojan War. He was a favorite of Minerva and aided Ulysses in carrying off the Palladium of Troy.

Dionne Quintuplets (*dē-ōn' kwin'tū-plēts*), five daughters born on May 28, 1934, to Mr. and Mrs. Oliva Dionne at Collander, Ont. These five babies were among the most talked of children in the world. The girls were named Marie Reine Alma, Emilie Marie Jeanne, Cecile Marie Emilda, Annette Lilianne Marie, and Yvonne Edouilda Marie. Emilie Dionne died Aug 6, 1954, in Ste. Agathe, Quebec.

Dionysius (*dī-ō-nish'ī-ūs*), Pope from 259 to 268 A.D. Following the persecutions of the Christians by the Roman Emperor Valerian (253-60 A.D.), it was Dionysius who rebuilt the administration of the Roman Catholic Church, uniting all the various sects and temporarily overcoming the danger of schism.

Dionysius THE AREOPAGITE, a legendary personality mentioned in the Acts 17:34, as a convert of St. Paul's. Allegedly, he was the first bishop of Athens and later became the first Christian missionary to Paris, in which city he was supposed to have been decapitated. Actually, St. Denis, the patron saint of France, who was the first bishop of Paris, lived between 250 and 300 A.D. and cannot possibly be identical with Dionysius the Areopagite. It is certain that the author, Dionysius the Areopagite, of the mystical works, "On the Ecclesiastical Hierarchy," "On Mystical Theology," etc., which had the greatest influence on theological thought until the time of the Renaissance, must have lived around 500 A.D. Dionysius the Areopagite was the man who was most successful in fusing the heritage of Greek Neo-Platonism (*q.v.*) with the ideas of Christianity. Basing his theology on Neo-Platonic ideas, he saw the ideal goal of man to be communion with God within the individual. The history of Christian theology over a period of many centuries takes up this concept and varies it without changing the central idea.

Dionysius THE ELDER, an ancient tyrant of Syracuse, Sicily, who was born about 430 B.C., and died in 367. His life was begun as a clerk in a public office, and he first took part in political affairs after the destruction of the Athenian expedition against Syracuse. During the invasion by the Carthaginians he was general in the army of Syracuse, which possessed a republican form of government at that time. He became ruler of Syracuse in the year 405, after the Carthaginian army had been thinned by pestilence. Subsequently he conducted a number of expeditions against the Carthaginians, gaining several victories, and extended his rule over other cities in Sicily. Later he completely crushed the Carthaginians near the walls of Syracuse and directed his efforts against Carthage. His success in war made him one of the most celebrated military men of his time. Besides aspiring to military renown, he sought to obtain poetical glory and

wrote several lyrics and tragedies. A number of his productions were hissed at the Olympic Games, but a tragic poem gained a prize at Athens. His reign of 38 years is generally described as efficient, leaving at his death a powerful empire and immense military stores.

Dionysus (*dī-ō-nī'sūs*), or DIONYSOS. See *Bacchus*.

Diphantus (*dī-ō-fān'tūs*), a Greek mathematician of the 3rd century A.D., whose date and place of birth are unknown. He wrote seven books on arithmetic and algebra, the earliest works on algebra now in existence. He solved many algebraic equations and his books give the solutions of over 130.

Diopter (*dī-ōp'tēr*), the unit of the power of a lens, which is equal to the reciprocal of the focal length in meters. The diopter is a unit of the ability of the lens to refract rays of light striking it. The power of the lens may be computed from the index of refraction of the lens material and from the radii of curvature of its faces. A flat sheet of glass has zero diopters power, while a highly curved lens has a large power.

Dioscuri (*dī-ōs-kū'rī*), in Greek mythology, the brothers Castor and Pollux (*q.v.*), twin sons of Leda and Zeus (Latin, Jupiter), the latter having approached Leda in the guise of a swan. Dioscuri later became the name of a stellar constellation, also called Gemini or twins.

Diphenylamine (*dī-fē-nīl-ām'in*), (C_6H_5)₂NH, is a weakly basic chemical formed by heating aniline hydrochloride with aniline to 240° C. It forms colorless crystals or scales melting at 52.9° C., slightly soluble in water and having a faint, pleasant odor. It is used to test for the presence of small amounts of nitrates and free chlorine; in the dyestuff industry; and in the explosive industry to stabilize nitro-cellulose powders by absorbing free acids.

Diphtheria (*dīf-thē'rī-ā*), an acute communicable disease characterized by the forming of a membrane, usually on the tonsils, soft palate, nose or larynx, frequently accompanied by swelling of the glands of the submaxillary region. It is transferred by direct contact with an infected person or a carrier through sneezing or coughing. If the diphtheria membranes are localized in the larynx there develops difficulty in respiration with danger of suffocation (see also *Croup*).

Under various names, diphtheria has been known for thousands of years, but it has been conquered only during the last 100 years. The diphtheria bacillus (*Klebs-Löffler bacillus*) was first described (1883) by one German physician, Edwin Klebs, and isolated (1884) by another, Friedrich Löffler. Behring discovered the diphtheria antitoxin in 1891, which marked a turning point in the treatment of the disease. In

1913 the Schick test (an injection of a very small amount of diphtheria toxin) for determination of susceptibility or immunity to diphtheria was introduced, and Behring, in the same year, discovered the first antitoxin for active immunization.

One attack of the disease does not always prevent a second attack. To determine whether or not an individual is susceptible to diphtheria, the Schick test is used. A small inflammatory reaction indicates that the individual is susceptible to diphtheria, and that he needs active immunization. Immunization is performed at the age of 9 to 12 months.

In case of diphtheria attack, antitoxin treatment is administered.

Diphtheritic (*dīf-thē-rī'tic*) **Paralysis**. See *Paralysis*.

Diphthong (*dīf'thōng*), the union of two vowels pronounced together in one syllable, with one impulse of the voice, as in *out*, *soil*, and *loud*. The term *improper diphthong* is applied to a word in which two vowels are written together, but only one representing a sound, as in *beat*, *bean*, and *bread*. Many diphthongs in modern English were developed from monophthongs, or simple vowel sounds, as the modern *mouse*, which was derived from the old English *mus*.

Diploid (*dīpl'oid*), in biology, the condition characteristic of the body cells of most animals and higher plants, including man, in which there are two of each kind of chromosome present in the nucleus. This is in contrast to a haploid, in which there is but one kind of chromosome, or a polyploid, in which there are more than one of each type.

Diplomacy (*dī-plō'mā-sī*), the term applied to the art of negotiating and arranging treaties between nations. This branch of knowledge relates to the forms of international negotiations, the relation of independent states to one another, and the management of envoys accredited to foreign courts. Intricate diplomacy like that of modern times did not exist in the nations of antiquity for the reason that the scope of civilization was often confined within the limits of a single empire. In Greece, Rome, Persia, and other ancient nations political agents were employed to discuss national affairs. The primitive movement in bringing about the regular intercourse existing between civilized powers has been accredited to the efforts of Cardinal de Richelieu, though the representatives sent by the Florentine republic to Charles V tend to show that he was not the first to perceive the benefits to be derived from such a system. Among the diplomatic agents recognized are ambassadors, envoys extraordinary, ministers plenipotentiary, ministers resident, *chargés d'affaires*, secretaries of legation, and *attachés*. The powers and dignities of these agents

are graded successively in the order named.

Diplomatic Privilege (*dī-plō-mā'tī'e priv'i-līj*), in international law, exemption from police regulations, arrest, taxation, and payment of customs duties accorded representatives of foreign countries and members of their households.

Dipper (*dīp'pēr*), a bird of the thrush family, but quite similar in appearance to the wrens. The bill is sharply pointed and almost straight, the plumage is compact, and the tail turns slightly upward. Several species are noted for their song. They live near the banks of streams and the shores of lakes, and feed on mollusks and aquatic insects. The dippers are so named from their habit of dipping the head, which is accompanied by an abrupt upjerking of the tail. Dipper is also the name given to the stars in the Constellation of the Great Bear, because of their arrangement in the form of a dipper or ladle.

Dipping Acid (*dīp'īng ās'īd*). See *Sulfuric Acid*.

Dipping Needle, an instrument to test the magnetism of the earth at different places. It consists of a magnetic needle supported by a stirrup or within a frame so as to be free to move vertically. When placed horizontally and then magnetized, the needle will not remain horizontal, but will dip toward the nearer pole of the earth. The angle of dip decreases as the distance from the magnetic equator increases. There is no dip at the magnetic equator, but the needle will assume a vertical direction at the magnetic poles, hence the distance increases from zero to 90 degrees.

Dipsomania (*dīp-sō-mā'nī-ā*), the morbid craving for alcoholic drinks, classed as a form of insanity. The attacks are periodical and when they occur the patient has an uncontrollable desire to drink excessively, but during the intervals he seems mentally sound and may abstain entirely from the use of liquor. The disease has been treated successfully in asylums for the inebriates. Institutions of this kind are maintained successfully in many states and countries.

Diptera (*dīp'tēr-ā*), an order of insects, the flies, having but one pair of wings, which are the front wings. The rear wings, which probably supply the sense of equilibrium and direction, grow to the size of two small rods only. The mouth organs are formed for sucking and piercing, not for gnawing.

Dirac (*dīr'āe*), PAUL ADRIEN MAURICE, mathematician and university professor, born in Bristol, England, Aug. 18, 1902. He first studied electrical engineering at Bristol Univ. (was graduated 1921) and then mathematics at St. John's Coll. in Cambridge. Dirac began work on quantum mechanics shortly after it was introduced by Heisenberg in 1925. He continued his work as a Fellow of the Royal Society (1930) and



Courtesy N. Y. Academy of Medicine

P. A. M. DIRAC

published many articles on the application of the quantum theory. In 1932, he became professor of mathematics at Cambridge. The following year, Dirac received the Nobel Prize in Physics, with Professor Erwin Schroedinger, for discoveries concerning the atomic theory. Dirac is known for his interpretation, on the basis of mathematical physics, of Bohr's electron-orbit theory on the behavior of electrons within the atom.

Direct Current (D.C.) (*dī-rēkt' ēā'rēnt*), a current of electricity characterized by unidirectional flow. Direct currents are necessary for charging storage batteries and for electroplating. They are conducted through metals by flow of negative electrons and through solutions by the motions of ions. Direct currents may be obtained from batteries and dynamos, or may be obtained by rectification of alternating currents.

Direction Finder (*dī-rēk'shōn find'ēr*), a radio receiver with a loop aerial accepting signals from only one direction. When used in navigation the aerial is rotated until signals received from a shore transmitter are loudest. The direction of the transmitter is determined from the position of the aerial, but in order to locate the transmitter's position it is necessary to obtain two bearings on the transmitting station. During World War II, ground direction finders were used to locate enemy radio stations.

Directoire (*dē-rēk'twār*), a style developed in France at the turn of the 18th century. See *Directory*.

Directory (*dī-rēkt'ō-rī*), the name applied to the government in France which was established by the constitution of Aug. 22, 1795. This body was composed of five members, who ruled in conjunction with two chambers—the Council of Ancients and the Council of Five Hundred. It



Courtesy Brown Bros., N. Y.

CORONATION OF JOSEPHINE BY NAPOLEON

Painting by Jacques Louis David, representative of the Directory period

was deposed by Napoleon (Nov. 9, 1799) and he assumed the government with Charles F. Lebrun and Jean J. Cambacérès as three consuls, on Dec. 15, 1799, his office being that of first consul.

Also a style developed in France during that time. It is characterized by an emphasized simplicity in contrast to the abundant frills of the Rococo. In painting, Jacques Louis David (1748-1825) was the representative artist of this period.

Dirigible (*dir'ī-jī-b'l*). See *Aviation*; *Balloon*; and color plate, *Man Masters the Air*, Volume II.

Disarmament (*dis-ār'mā-ment*). The history of modern times contains much speculation as to methods of eliminating war from the world. One of the most popular of such concepts is that war can be abolished by abolishing the means of making war, hence disarmament.

All recent wars have been followed by widespread disarmament movements. The period between the First and Second World Wars was particularly rich in such negotiations. The last great effort came in the period from 1930-34, when the League of Nations sponsored a number of conferences aimed first at disarmament, then at limitation of arms, and finally at the elimination of certain types of aggressive warfare.

During this period Hitler rose to power in Germany, and his withdrawal from the League ended all serious attempts to achieve peace through dis-

armament. Since World War II disarmament proposals have been under discussion by the U.N.

Discharge (*dis'chārf*), **ELECTRIC**, the passage of electricity observed when the potential difference across a sample of air or other gas reaches a value sufficient to make it conducting. Electric discharge is facilitated by reducing the pressure of the air. It is usually performed in a partially evacuated tube, where the discharge occurs between metal electrodes or terminals and results in the production of light in parts of the tube.

Discipline (*dis'i-plīn*), a system of training, mentally and morally. Also, the enforcement of established practices, rules, regulations, etc., on a group or community, according to a certain method or code. Militarily, it is the indispensable foundation of effective co-ordination of the complex military machinery, in time of peace or war.

Discipline, **BOOKS OF**, in the Church of Scotland, the fundamental rules which comprise the constitution and procedure of the Church, and instituted in 1575. The constitution was written in 1560, mainly by John Knox (*q.v.*).

Disconformity (*dis-kón-fór'mī-tý*), the omission of some sedimentary rocks in a sedimentary rock series due to erosion superseding sedimentation for a period of time. In the formation of a series of sedimentary rocks, the rocks are formed by the continual deposition of sand, gravel or clay

which accumulates in horizontal *parallel* layers or strata. When this process is interrupted by erosion intervening for a greater or less period of time to be followed by the deposition of sediments, the break in the sedimentation process is called a *disconformity*. A *disconformity* is recognized by the two sets of strata, divided by the *disconformity*, lying parallel to each other and separated by a somewhat undulating erosion surface, which fact in practice is often extremely difficult to determine.

Discount (*diz'kount*), a deduction from a sum of money due at a future date, or from the price at which a commodity is generally sold. Banks usually deduct a small per cent from the face of a note when purchasing such a paper, called *bank discount*, and this deduction is an item of profit in addition to the rate of interest specified in the note. When a loan is made to a customer by a bank, it is quite usual to deduct the interest in advance, hence the person borrowing receives a sum slightly less than the face of the note he gives at the time the loan is made. Merchants usually get a discount from the wholesaler when they pay cash within 10 days from the date of shipment, or a smaller discount if they pay within 30 or 60 days, and quite frequently the merchant has a similar system in giving his customers a small discount where a bill is paid cash or within a short time. Deductions of this kind are said to be based on trade or commercial discounts.

Disease (*diz-ēz'*), a state of ill health, usually applied to the absence of health from all causes except old age. *Organic* diseases arise from an unhealthy condition of the organs of the body, while *functional* ailments are due to causes which prevent the organs from doing their work properly, though they may be sound. Diseases may exist without pain or uneasiness in the ordinary meaning of these words, but hardly without functional disturbance or incapacity of some kind. Bacteria, sudden exposure, and foreign substances that cause poisonous products within the body are among the prolific causes of physical ailments. Diseases are *diathetic* or *enthetic*, the former arising from predisposition and the latter from without the patient. See also *Health*; *Medicine*.

Diseases of Plants, the ill health of plants, which causes their death or interferes with their normal development. The importance of this topic has been developed under a systematic study of plant life, and writers have become able to group and treat plant diseases with a high degree of accuracy. They are usually classified according to their causes, which are fungi, insects, bacteria, and physiological conditions. The *fungi* include such diseases as mildews, grape rot, potato rot, and the smuts and rusts of grains. Diseases of this kind are spread by minute spores, which are carried from plant to plant by insects, by the wind,

and by other agencies. The plant on which they lodge is attacked, if the conditions are favorable, and the diseases make rapid progress, causing either death or decay of a part or of the entire plant.

The diseases due to *insects* are numerous, especially in the forests and orchards. The *phylloxera* (*q.v.*), a prolific cause of disease among grapes and orange trees, is much dreaded in many parts of Europe. Carnations and many other flowering plants are attacked by the aphides, and eelworms attack the roots and cause galls in many economic plants. Diseases due to *bacteria* include the black rot of cabbage, the blight of apples and pears, and a wilt disease in cucumbers and melons. *Physiological* diseases are due chiefly to unhealthy conditions that surround the plants, such as unsuitable light and heat and improper nutrition. Plants subjected to ill health from these and similar causes turn yellow and rarely develop their fruit.

Disinfection (*diz-in-fēk'shūn*), in hygiene, that process by which any object (or even an entire room) is cleansed of contagious germs. This can be achieved either through poisonous gas (sulphur dioxide) or through fluids, such as carbolic acid, which is the more popular. Diseased seeds or plants can also be disinfected by copper sulfate. Specific germs require specific disinfectants. See also *Germicides*.

Dismal Swamp (*diz'məl swōmp*), marshy land located in North Carolina and Virginia. Formerly it was 40 m. long and 20 m. wide, but it has been reduced somewhat by draining. It is covered largely with trees, consisting mostly of cypress, juniper, and cedar, with dense brushwood underneath. In the most elevated portions, oak and beech trees abound. Canals have been constructed through it, being utilized for shipping timber for the manufacture of railroad ties, lumber, and shingles. Lake Drummond, 6 m. long, is a sheet of water in the midst of the swamp. A navigable canal connects this region with Albemarle Sound and Chesapeake Bay.

Disney (*diz'ni*), (WALTER E. (WALT), producer of animated cartoon films and creator of *Donald Duck* and *Mickey Mouse*, born in Chicago, Ill., Dec. 5, 1901. He studied at the Chicago Acad. of Fine Arts, then drew advertising cartoons in Kansas City (1920-22). In Hollywood he produced "Oswald the Rabbit" (1926), followed (1928) by the "Mickey Mouse" and "Silly Symphony" series. His first full-length cartoon film, "Snow White and the Seven Dwarfs," won him a 1938 Academy award, the first of many he was to receive. Subsequent cartoon films include "Pinocchio" and "Fantasia" (1940), "Bambi" (1942), and "Cinderella" (1950). The skill and meticulous detail of Disney's production methods won enormous popularity for the medium, which attained wide use

in other fields, particularly television advertising. Disney also made live-action films, including "Treasure Island" (1950), and true-life adventures such as "The Living Desert" (1953), "Secrets of Life" (1956). "Son of Flubber" appeared in 1963. In 1954 he opened Disneyland, an amusement park at Anaheim, Calif., near Los Angeles. He also produced such feature-length films as "Pollyanna" (1960).

Displaced Persons, the name coined by the U.S. Army (and frequently abbreviated as D.P.'s) for residents of internment camps in Austria, Germany, and Italy who were uprooted by World War II and were unable or unwilling to return to the countries of their origin. These displaced persons included both Christians and Jews, who continued to live in the camps through fear of religious and political persecution in Soviet-dominated countries or Germany. The U.N. established the International Refugee Organization to arrange for resettlement of displaced persons. In the U.S. the Displaced Persons Act was passed in 1948, permitting the admission of 205,000 refugees during a two-year period. Other countries agreed to accept varying numbers of D.P.'s, but as late as 1949 there were still almost 1,000,000 persons without home or homeland. In 1951 the Office of the U.N. High Commissioner for Refugees was created and charged with providing international protection to refugees falling within the scope of its mandate, and seeking permanent solutions for the problem by facilitating voluntary repatriation of refugees or their assimilation within new national communities. At the end of World Refugee Year (June 1959-60), the D.P. camp population was estimated at 13,800.

Disraeli (*diz-rā'li*), BENJAMIN. See *Beaconsfield, Earl of*.

D'Israeli or DISRAELI, ISAAC, author, born in Middlesex, England, in 1766; died Jan. 19, 1848; father of the Earl of Beaconsfield. He was educated at Amsterdam and Leyden and began a career as a poet and novelist, but soon turned to historical work. His writings are noted for their stylistic elegance. Among his principal works are the six-volume "Curiosities of Literature" and the three-volume "Amenities of Literature." The greater portion of his life was spent in library research.

Dissociation (*dī-sō-shī-ā'shūn*), the process whereby a chemical compound reacts or breaks up under one condition and changes back to the original compound when the original conditions are restored. Such reactions are classed as reversible. An example occurs in lime-burning where calcium carbonate dissociates into calcium oxide and carbon dioxide. If the carbon dioxide is removed, lime remains, but when carbon dioxide is restored calcium carbonate results. Thus the car-

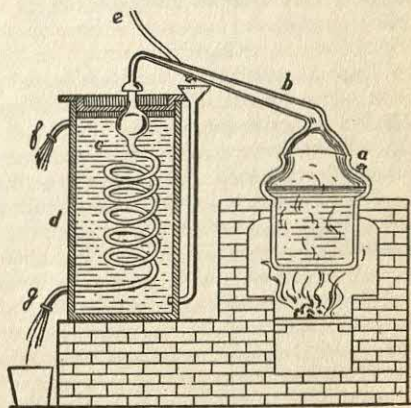
bon dioxide develops a dissociation pressure which increases with the temperature, and it tends to escape, but at lower temperature, the carbon dioxide again tends to re-enter into combination with the calcium oxide, and equilibrium is established. That pressure at any temperature which will prevent dissociation is called the dissociation pressure.

Distaff (*dīs'tāf*), the name of a short staff used by women to hold flax, cotton, or wool in spinning (*q.v.*). Today, by long association, the word is used figuratively to symbolize woman or women generally. Thus "on the distaff side" may refer to the female branch of a family, as distinguished from the "spear" or male side, or, more broadly, it may be used to refer to female pursuits or interests.

Distemper (*dīs-tēm'pēr*), in art, a mode of painting, in which a binding medium of glue or egg is used. This form of painting is used chiefly in scene painting.

The word also has a literal reference to any physical disorder causing generalized illness or malaise. Specifically, among dogs, distemper is a contagious and infectious disease producing alterations of fever and widespread destruction of brain and nerve tissues. It is thought to be caused by a filterable virus and commonly transmitted by air, feeding utensils, contact, etc.

Distillation (*dīs-tīl-lā'shūn*), the process of purifying or separating one or all of the components of a mixture by heating it in a retort or vessel so constructed that the vapors thrown off are collected and condensed. A representation of the apparatus used is shown in the accompanying illustration. The retort or vessel, marked *a* in the figure, is called the *body* of the still, in which the vaporization takes place, and from it the vapor is carried by pipe *b*, to the condenser, which is cooled for condensing purposes by a stream of cold water flowing in through pipe *e*, and out through pipe *f*. The worm tube *d* con-



DISTILLING APPARATUS

DISTILLATION

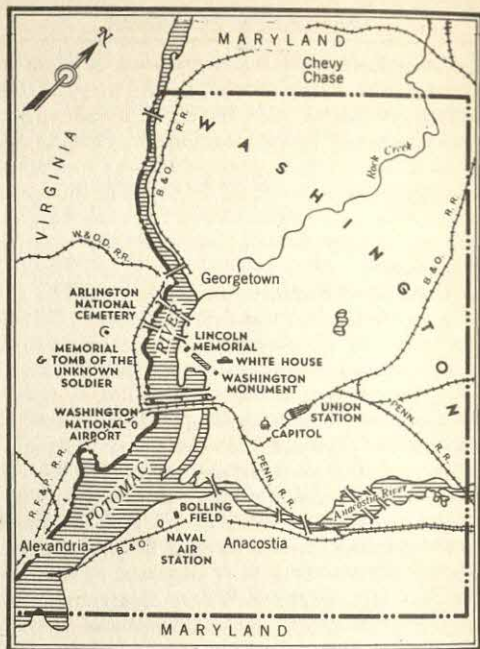
tains the coiled tube, or worm *c*, in which the condensation takes place, and the distilled liquid flows out at *g*. Provision for the removal of residues must always be made.

This primitive still has been modified by industrial development until each part is adapted to the material being distilled. The still body for zinc distillation is a long thimble; for coal it is built of fire clay in special shapes to permit the removal of residual coke; for wood, to produce charcoal, it is a long metal box in which wood is placed in open rack cars upon rails. Bones for the production of bone-char and pyridine are usually distilled in a cylindrical still mounted so as to be rotated. Calcium acetate is distilled in such a rotating drum to produce acetone. Distillation of material at temperatures which cause decomposition is called *destructive distillation*. In the case of petroleum oils, destructive distillation under pressure is called *cracking*. The still body for cracking has undergone such development that it consists chiefly of a bundle of tubes, and the vapor tube has been expanded into an entrainment vessel. Wine or beer may be distilled to produce a low-grade alcohol. If this distillate is separated into fractions and the fractions again distilled separately, the process is called *fractional distillation*. Similarly, distillates of tars, coal, wood, bone, and petroleum are fractionally distilled to separate major portions of the components, such as benzol, naphthalene, pyridine, and phenols.

When steam is blown directly into the still, as in the recovery of volatile essential oils from rose petals, geranium leaves, citronella grass, camphor, peppermint, the process is called *steam distillation*. Steam in coils is often used for heating the stills. Sea water or other impure waters may be distilled to obtain pure or distilled water, the first portions being rejected because they contain ammonia, sulphurous compounds, and gases.

Vacuum distillation, *i.e.*, distillation at low pressures, allows the use of low temperatures, desirable when excessive heat may be injurious to one of the substances being separated.

Continuous distillation was developed by the use of apparatus whereby vapors from one still were led to another before going to the condenser. This improvement was amplified by superposition of the still bodies one above the other. A three-chamber still is used in whisky distilleries to make "heavy body" whisky. Subsequently, many chambers of reduced size were superimposed to produce a stripping column wherein the liquid charge descends against a stream of vapor continuously. This form of continuous countercurrent column distillation is commonly practiced for many distillations. The vapors may be condensed or led to a fractionating column. See *Fractionation*.



DISTRICT OF COLUMBIA

Distress (*dīs-trēs'*), in law, the right of a creditor to seize the property belonging to his debtor in case of default in payment of debt, and to sell such property for the purpose of satisfying his claim.

Distribution (*dīs-trī-bū'shūn*), a marketing (*q.v.*) term referring to the diffusion of goods through trade channels. Because of geographic and economic reasons, mines, farms, and factories are often located some distance from their ultimate customers. In order to spread the producers' output over the market, middlemen are needed. Wholesalers and retailers are called middlemen, because they bridge the gap between producers and users. Some producers, however, distribute their goods directly to users, mostly when the problems involved in marketing are not too complex.

Modern economies are characterized by a growing volume of production, which necessitates an increasingly effective distributive system; and technological improvements are continuously made in the distributive functions of buying, selling, shipping, and warehousing. Mass distribution has made it possible for an ever greater number of people to enjoy the benefits of the growing output of goods and services. In the process, more and better jobs have become available in production and marketing activities, making possible, accordingly, a higher standard of living.

District Attorney (*dīs'trīet a-tēr'nē*), an officer of the law charged with the prosecution of legal violations committed within his designated

jurisdiction. In the U.S., the President appoints a Federal district attorney for each Federal judicial district; the states elect their district attorneys, who also serve as county attorneys. The usual abbreviation is D.A. See also *Federal Courts*.

District of Columbia (*dī'strīet of eō-lūm'-bi-a*), a Federal district of the U.S. coterminous with the city of Washington, D.C. (*q.v.*), situated on the N.E. bank of the Potomac River, with a land area of 61.24 sq. m. and 7.01 sq. m. of water. The Anacostia River flows through the eastern section, and Rock Creek bisects the northwest area.

The site of the Federal district, 100 m. square, chosen by President Washington, and ceded by the states of Maryland (1788) and Virginia (1789), was accepted by Congress in 1790. Andrew Ellicott was appointed to survey the boundaries, and Pierre Charles L'Enfant (*q.v.*), to lay out the city, to which the government moved in 1800. When, in May 1802, Congress incorporated the city of Washington, the District embraced, in addition, the counties of Washington and Alexandria and the incorporated towns of Alexandria and Georgetown. Disappeared in the rate of growth of the capital, Virginia requested, and received, the 30 sq. m. of territory she had ceded, in 1846.

The U.S. Constitution vests in Congress the power "to exercise exclusive legislation" over the District; acting through District Committees of Congress, it makes all laws and appropriations. In 1878 Congress established a municipal corporation for the entire District under a board of three commissioners, appointed by the President and confirmed by the Senate. One of the commissioners is an officer of the Corps of Engineers (U.S.A.). At least three years' residence is required of a civilian commissioner. The judiciary is appointed by the President. In 1878 District residents lost the right to exercise suffrage, but government employees claiming residence in their respective states retained their vote. However, the 23rd Amendment to the Constitution, effective in 1961, returned to the residents the right to choose Presidential electors. Population, 1960, 763,956.

Ditmars (*dīt'märz*), RAYMOND LEE, naturalist, known especially as an authority on snakes, born in Newark, N.J., June 20, 1876; died in New York City, May 12, 1942. He was graduated from Barnard Military Acad., New York City, in 1891. After five years as assistant curator of entomology at the American Museum of Natural History, he reported (1897-98) for the *New York Times*. From 1899 on, he was curator of reptiles at the New York Zoological Park, superintending the department of mammals after 1910. His writings include "The Reptile Book" (1907), "Strange Animals I Have Known" (1931), "The Book of

Living Reptiles" (1936), and "The Book of Insect Oddities" (1938).

Diver (*dī'vēr*), any one of a group of swimming, diving birds, especially those of the family *Colymbidae*. Applied at various times to grebes, auks, and loons, the term is restricted by some to the loons alone. Three species are noteworthy, the great northern diver (*Colymbus torquatus*), the black-throated diver (*C. arcticus*), and the red-throated diver (*C. septentrionalis*). Characterized by webbed toes, a short and rounded tail, short wings, and a straight, strong and pointed bill, divers are noted for quickness in diving and for the length of time they can stay, and the distance they can cover, under water. Found in the Northern Hemisphere generally, they feed on fish.

Divide (*dī-vid'*) or WATERSHED, a geographical and geological term which refers to a height of ground separating two water courses or systems. Some divides are relatively low and insignificant, while others may be formed by whole mountain chains. The North American continental divide is formed by a series of ridges of the Rocky Mt. system, which extends from Canada to Mexico. This divide separates into Pacific and Atlantic coast drainage basins. In the U.S. this continental divide extends from the Waterton Glacier-International Peace Park, on the Canadian-U.S. border, southeastward across western Montana and the Yellowstone Park area of western Wyoming and southward across western Colorado and extreme western New Mexico. It continues into Mexico, forming the Sonora-Chihuahua border line. In the U.S. the continental divide not only separates the major river systems but also, because of elevation, is a dividing line between climate and vegetation zones.

Divide et Impera (*dī'vī-dē ēt īm'pē-rā*), Latin, meaning divide and rule, an autocratic principle ascribed to Niccolò Machiavelli (*q.v.*). It was the political tenet of Louis XI (1423-83), the absolute ruler of France, whose policy was to safeguard his despotism by playing his rivals one against the other.

Dividing Engine (*dī-vid'ing ēn'jin*), a machine for ruling diffraction gratings and scales. The essential feature of the dividing engine is an accurate screw which advances a definite distance for each rotation. Fractional rotations for subdividing the full interval into any number of parts are obtained with a divided circle attached to the screw. By use of the dividing engine, Prof. R.W. Wood (born 1868) has ruled diffraction gratings which have more than 30,000 accurately spaced and parallel lines in each inch of grating.

Divination (*dīv-i-nā'shun*), the art of foretelling future things by revelations from oracles or omens. Those who profess the power to divine or foretell future events rely upon observing the flight of birds and clouds and the movements of



Courtesy Australian News & Information Service, N.Y.

PEARL DIVER

the planets, or base their belief on the influence of spirits or supernatural causes. Various forms of divination were practiced by the ancient Romans and Greeks, who probably came to believe in the art from the practices which prevailed in Egypt and Chaldea. The laws of Moses prohibited it among the Israelites, who were not permitted to perform any kind of divination. The medicine men among the Indians of America practiced it to some extent, and it still has adherents in some countries.

Divine (*dī-vīn'*), FATHER, religious name of GEORGE BAKER, born perhaps near Savannah, Ga., about 1882. A Negro preacher with considerable eloquence and personal magnetism, he built up, in the depression years of the 1930's and after, a sizable cult, flourishing chiefly in New York, Philadelphia, and other northeastern cities.

Divine Comedy. See *Dante Alighieri*.

Divine Right of Kings, an ancient claim made by some sovereigns that they hold their office by divine appointment. According to this view, they assert the right to govern their subjects without interference, opposition to the government being regarded in the light of a sin. This doctrine was held by numerous English sovereigns and princes, especially in the time of the Stuarts. It is a tenet pleasing to despotic rulers, and proportionately displeasing to the mass of their subjects. It is spoken of by Pope in these words, "The divine right of kings to govern wrong."

DIVING

Diving (*dīv'ing*), any one of several methods of descending and remaining for varying periods of time under water. Diving is practiced in fishing for pearls, sponges, and corals; in exploring the bottoms of rivers and the sea; in recovering valuable stores of sunken ships or in raising or removing such ships. Some forms of diving are also popular as sport.

A skillful diver may remain under water from two to three minutes without breathing equipment. This primitive form of diving was practiced in early times near the shore but has gone largely out of use. For effective service, it is necessary to provide the diver with apparatus by which fresh air can be supplied in sufficient quantity to enable him to remain under water for some time.

The diving bell, though used centuries ago, was first made of material value in the 18th century. Its name derives from its bell-shaped form. The principle involved in the diving bell may be illustrated by inverting a tumbler and pressing it down in a container of water. Although the water rises to a certain level in the tumbler, the upper part remains dry; and a candle will burn in it for a short time, with increased energy because of the condensation of the air by pressure. The diving bell receives fresh air from a pump on the surface, while impure air escapes through a cock at the upper part of the bell. The bell generally is made of cast iron and contains strong convex lenses in the roof or upper side for the admission of light. It is suspended by chains from a vessel on the surface, and it may be raised or lowered from within.

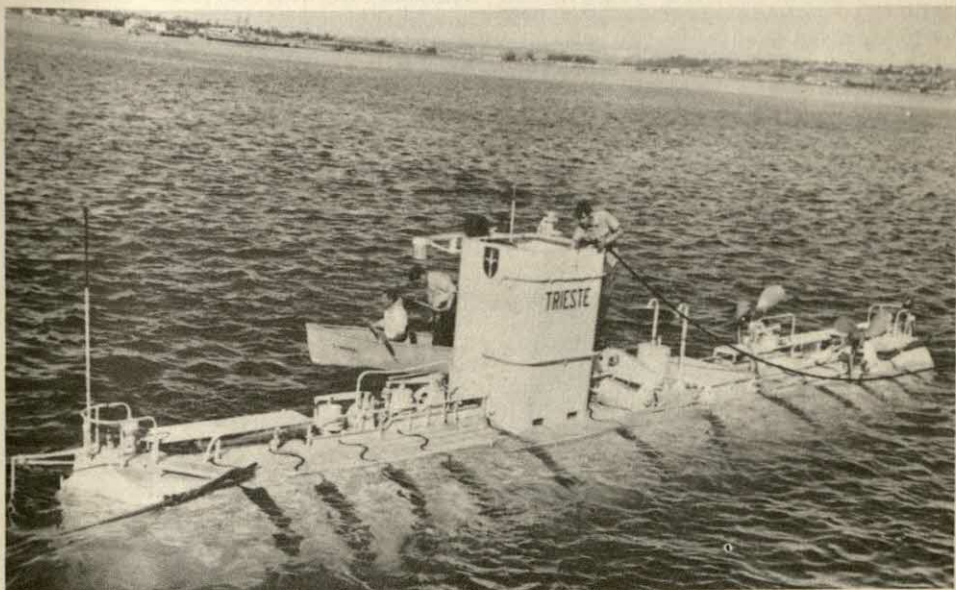
Another method of underwater exploration is the bathysphere, used notably by Dr. Charles William Beebe (*q.v.*). The bathysphere, which has made possible much deeper descents than any diving suit permits, is a strongly built metal ball with windows and floodlights. It carries normal air pressure inside and relies on its own strength to resist the crushing force of the water. Men have descended more than 3,000 ft. in a bathysphere. Another device of this type, the bathyscaphe, is a kind of submarine invented by Auguste Piccard (*q.v.*). The bathyscaphe can withstand pressures of three tons to the square inch and has carried explorers to a depth of more than 13,000 ft.

A device that permits greater freedom of movement under water is the diving suit, a waterproof outfit made of cloth-covered rubber that covers the entire body. The head is covered by a helmet containing three "lights" or face glasses, covered with glass and protected by guards. An air pump (*q.v.*) above supplies air to the helmet through a flexible tube, and the impure air escapes through a valve. The diver sinks to the



EXPLORING THE WORLD BELOW

A diving suit (left) requires contact with the surface for air (*Wide World Photo*). A skin diver (right) is independent of the surface, carrying his own air supply (*UPI Photo*). The bathyscaphe (below) is capable of sustaining the enormous pressure of water at depths as great as 13,000 ft. (*Wide World Photo*)



bottom by means of lead weights on the soles of the shoes or the feet. Telephone connections (in use since the late 1920's) enable him to maintain contact with persons on the surface. Another improvement is a compressed-air device which automatically regulates the air flow according to the water pressure. Improvements in diving equipment make it possible for a diver not only to conduct the usual rescue and salvage operations, but

also to cut metal with a torch fed by hydrogen, oxygen, and compressed air.

A workable diving bell was introduced by Edmund Halley in England in 1717. The device was made of wood, with windows, and with leather tubes to carry air to the interior. The first practical diving suit was devised by Augustus Siebe, a German-English inventor, in 1819. This consisted of a leather jacket with a metal helmet.

Air was supplied by means of an air pump at the surface. Unlike the modern diving suit, it was open at the bottom. As in the diving bell, air pressure kept the level of water below the diver's chin. By 1830 Siebe had perfected the closed diving suit, which was essentially like the modern suit of rubberized cloth.

The length of time a diver can remain under water depends on the depth at which he is working. At a depth not exceeding 50 ft., he can remain as long as 8 hr. At 150 ft., however, he can remain only about 20 min. One of the risks faced by deep-sea divers is the condition known as the "bends" (See *Aeroneurosis*). In order to withstand the terrific pressure of the water, the diving suit must build up an even greater pressure of compressed air. This tends to force the nitrogen of the air into the blood stream of the diver. Unless he returns to normal air pressure gradually, bubbles of nitrogen collect in his blood stream, causing intense pain. The precautions against the bends are either a slow rise to the surface or a period in a decompression chamber in which compressed air is slowly reduced to normal pressure.

The most recent form of underwater exploration is *skin diving*, in which the diver goes below as a self-contained unit. He may wear an ordinary bathing suit or a special body-fitting rubber suit. Flippers are worn on the feet as an aid in swimming, and tight-fitting goggles cover the eyes. The breathing apparatus consists of

tanks of compressed air, worn on the back and connected with a fitted mouthpiece by means of a flexible tube. With this equipment, called *Scuba* (self-contained underwater breathing apparatus), the diver is completely independent of the surface. Skin divers have been known to descend as deep as 350 ft. Within its depth limitations, skin diving has uses as varied and valuable as those of any other form of underwater work; in recent years, however, it also has leaped into prominence as a sport. The equipment is relatively inexpensive, and it offers a wide variety of new and exciting experiences.

Another kind of diving is that practiced in connection with swimming. Called *fancy diving*, it is performed from a springboard and consists of various intricate, and sometimes extremely graceful, maneuvers in the air before the body enters the water. Regulations for competitive diving list the following five main groups of dives: (1) the forward dives; (2) the backward dives; (3) the gainer dives, in which the body faces the water but turns backward in mid-air; (4) the cutaway dives, in which the body faces away from the water, but turns and enters it in a forward position; and (5) the twist dives, in which the body twists before entering the water.

All these dives can be performed using three principal body positions: the layout, in which the body, arms, and legs are kept straight; the pike, in which the body is bent at the hips but the legs are kept straight; and the tuck, in which the knees are bent and brought up to the chest. Variations on these basic positions include the swan dive, in which the body is arched and the outstretched arms are brought together as the diver nears the water, so that he enters it hands first; the jackknife, in which the diver bends his body at the hips at the highest point of ascent, then straightens before touching the water; and the full gainer, in which the diver enters the water feet first after executing a back somersault.

Fancy diving has become a separate competitive sport apart from swimming and is featured in many aquatic meets.

See also color plate, *Ocean Life Among the Coral Reefs of the Tropical Pacific I*, Volume VIII.

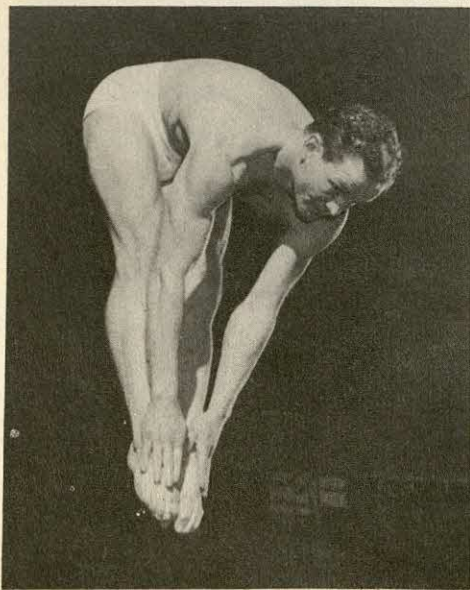
Divining Rod (*dī-vīn'ing rōd*), a device used for the location of underground water, metallic ores, and buried treasure, to detect criminals, to analyze personal character, etc. The form of the divining rod varies widely but regardless of type none are accepted as having scientific value.

The most familiar form is the forked twig, shaped like the letter Y, one fork of which is held in each hand so the butt end points up. The stem will supposedly be pulled down when over the object desired.

THE ART OF DIVING

A forward jackknife

Wide World Photo



Division (*dī-vīzh'ūn*) is one of the four basic operations of arithmetic. The need for division arises out of the sharing of something equally with others. If Mary has 20 cookies and is to share them with four playmates, she encounters a division problem. She may lay out five cookies one by one, then add a cookie to each of the first five, then another to each group, and so on until all of the cookies are used up. When she has finished she may notice that each person gets four cookies. In a simple way she has performed a division, which would be denoted in the usual symbols by $20 \div 5 = 4$.

The division of 20 cookies among five people may be viewed as a process of successive subtraction; that is, from 20 take away four five times. This division may also be viewed as the seeking of the number which, when multiplied by five, will yield 20. Division is usually defined in this second way, and the definition may be stated: the number c is called the quotient of a divided by b , if $b \times c = a$. The number a is called the dividend and b the divisor. Multiplication and division are said to be inverse operations, since, if the multiplication of a number a by b is followed by the division by b , the result is the original number a , thus $(a \times b) \div b = a$.

As a consequence of the definition of division, we can see that a divisor can never be zero. For, if the divisor b were zero and a were not zero, there is no number c which satisfies the condition $0 \times c = a$; and, if b and a are both zero, then any number c satisfies the condition $0 \times c = 0$. Thus division by zero is a meaningless operation and is always excluded in mathematics.

Division, a military term, referring to the basic combination of armed personnel capable of independent action. The unit is common to most of the world's armies.

In the U.S. Army (see *Army, United States*), the division is the smallest type of unit which includes elements of infantry, artillery, armor, and

service troops as part of its permanent organization. It is commanded by a general officer. Two or more divisions make up a corps. See also *Battalion*; *Regiment*.

There are three types of division: airborne, armored, and infantry. They vary in organization and size, as well as in supporting units. The airborne and infantry divisions are organized on the pentagonal, or pentomic, principle—referring to their five component battle groups. The airborne battle group includes five rifle companies and a mortar battery; the infantry battle group, four rifle companies and a mortar battery. The armored division has four armored battalions and four armored infantry battalions. All have atomic and nonatomic firepower and suitable transport units. The airborne division has 11,486 officers and men; the armored, 14,617; and the infantry, 13,748. See also *Troops, Mechanized and Motorized*.

Divorce (*dī-vōrs'*), in modern law, dissolution of a contracted marriage; granted by courts under general laws, and sometimes by the legislature; a divorce does not apply to separations or annulments for causes that existed prior to the marriage. Divorce has been recognized in most societies known to history. In primitive societies, economic considerations, e.g., the necessity to return the "bride price," restricted divorce to some extent. In Greece and Rome, marriage was considered to be a contractual relationship, and its dissolution was a private matter. Christianity and the early Church made a definite change in such views. The Roman Catholic Church does not permit divorce, although various reasons for annulment or legal separation are recognized. Most Protestants and Jews, however, hold the contractual view of marriage. The grounds for divorce or separation recognized by religious bodies include the traditional ones of adultery and cruelty, as well as insanity and incurable disease. Other traditional causes are barrenness, impotence, fail-



DIVISION ON MANEUVERS

Paratroopers of the 82nd Airborne Division "hit the silk" during large-scale military maneuvers

ure of the wife to produce male offspring, ill treatment of various kinds, gross neglect, and desertion. In the U.S., the most frequently offered reasons are adultery, cruelty, desertion, drunkenness, and neglect to provide. The laws vary considerably from state to state, but all U.S. states have divorce laws. Because of the variations, divorces legal in one state may not be recognized as valid in another. Laws regarding remarriage also vary.

The U.S. divorce rate showed an increase from .28 per 1,000 population in 1870 to .73 in 1900 and 1.63 in 1928. With the depression, the rate went to 1.3, but it again climbed to 4.3 in 1946, the high point; it was back to 2.3 in 1956 and 2.2 in 1959. There were 1,494,000 marriages in 1959, a rate of 8.5 per 1,000 population, and 395,000 divorces. Thus the proportion was about 1 divorce to 4 marriages. Both marriage and divorce numbers and rates decreased over the period 1950-60. The unusually high 1946 divorce rate has been traced to the frequent hasty marriages of the war period.

Rates for other countries vary considerably: France (1959) had one of .59 per 1,000; West Germany (1959), .83; and East Germany (1960), 1.38. In Berlin, the Eastern sector had a 1960 rate of 2.8, while the Western-sector rate was 2.04. Within Great Britain, the range in 1960 was: England and Wales, .51; Northern Ireland, .07; and Scotland, .34. Canada's rate in 1960 was .39.



Courtesy Brown Bros., N. Y.

DOROTHEA L. DIX

Various stipulations are made in divorce decrees; typical ones are arrangements for alimony (*q.v.*) and for the custody of children. See also *Husband and Wife; Marriage*.

Dix (*dīks*), DOROTHEA LYNDE, humanitarian, born in Hampden, Maine, April 4, 1802; died in

Trenton, N.J., July 17, 1887. She was educated in Boston, Mass., and began teaching school at the age of 14. She soon established her own school for girls and directed it until forced to stop in 1835 because of ill health. She also wrote a number of books, including meditations and stories for children. In 1841 she became aware of the cruel way insane persons were treated; there were at that time only eight insane asylums in all the U.S. She started to investigate conditions in Massachusetts, and on her insistence the state legislature passed a bill to enlarge the Worcester insane asylum. She then began her investigations on a nationwide scale. For the next 13 years she traveled thousands of miles, though still in poor health, and was able to have founded or enlarged more than 15 hospitals for the insane in the U.S. and Canada. From 1854 to 1857 she visited hospitals in England and the Continent. After her return she traveled again throughout the U.S., raising money and inquiring into conditions. During the Civil War she served as superintendent of women nurses and after the war, continued to work on behalf of the insane until her retirement at the age of 80.

Dix, DOROTHY. See *Gilmer, Elizabeth*.

Dix, JOHN ADAMS, soldier and statesman, born in Boscawen, N.H., July 24, 1798; died in New York, N.Y., April 21, 1879. He was educated at schools in New England and Montreal, Que. He received a commission in the army at the age of 14 and took part in the War of 1812. A few years later he served as traveling aide to Maj. Gen. Jacob Brown (*q.v.*). He read a great deal, studied law, and was admitted to the bar in 1824. He resigned from the army with the rank of major in 1826 and settled in New York State, where he practiced law. In 1830 he was appointed adjutant general of the state and then was secretary of state (1833-39). He served in the U.S. Senate, 1845-50, and subsequently withdrew from public life for a time, practicing law in New York City. He was postmaster of the city, 1860-61, then was appointed Secretary of the Treasury by President Buchanan in 1861. Abraham Lincoln commissioned Dix a major general the same year, and Dix served in that capacity during the rest of the Civil War. Afterward, he was minister to France, 1866-69, and governor of New York, 1872-74. His published works include "A Winter in Madeira; and a Summer in Spain and Florence" (1850); and translations of "*Dies Irae*" (1863) and "*Stabat Mater*" (1868).

Dixie (*dīks'ē*) or DIXIE'S LAND, nickname for the Southern states of the U.S. One theory of its origin says that Dixie was a kindly slaveowner in Manhattan at the end of the 18th century. His slaves who were sold to owners in the South thought with longing of his plantation and called it Dixie. Later the name was transferred to the

South. Another theory is that the name came from the \$10 bills issued by the Bank of New Orleans before the Civil War, which had the French word *dix* on them. Thus the South, and especially Louisiana, came to be called the land of Dixie. A third theory is that the name was derived from the Mason and Dixon's Line (*q.v.*).

Dixie is also the name of a song written in 1859 by Daniel D. Emmett (*q.v.*). It became popular in the South when it was played at the inauguration of Jefferson Davis (*q.v.*), Feb. 18, 1861, and was the marching song of the Confederate forces during the Civil War.

Dixmuide (*dīks-moi'dē*) or DIKSMUIDE, a town in West Flanders, Belgium, on the Yser River, 13 m. n. of Ypres. During World War I it was flooded to halt the advance of the Germans toward the coast. In World War II it was again taken by the Germans. Population, *ca.* 3,000.

Dixon (*dīk's'n*), a city in northern Illinois, seat of Lee County, on the Rock River, about 98 m. w. of Chicago. It is on the Chicago and North Western Ry. and the Illinois Central R.R. (freight). Manufactures include steel products, cement, shoes, and dairy products. The value added by manufacture in 1958 was \$19,495,000. The surrounding countryside is a fertile farming district. The city was founded in 1830 and incorporated in 1857. Population, 1900, 7,917; in 1940, 10,671; in 1960, 19,565.

Dixon, JEREMIAH. See *Mason and Dixon's Line*.

Dixon, THOMAS, writer, born in Shelby, N.C., Jan. 11, 1864; died in Raleigh, April 3, 1946. He was graduated from Wake Forest Coll. in North Carolina and became a Baptist clergyman, holding a New York City pastorate for 10 years (1889-99). He resigned from the ministry to pursue a writing career. His book "The Clansman" was adapted (1915) into the historic movie "The Birth of a Nation."

Other writings include "The Southerner" (1913), "The Inside Story of the Harding Tragedy" (in collaboration with Harry M. Daugherty, 1932), and "The Flaming Sword" (1939).

Dixon, WILLIAM HEPPWORTH, author, born in Manchester, England, June 30, 1821; died in London, Dec. 27, 1879. He began work as a clerk but in 1846 took up journalism. He was editor of the *Athenaeum*, 1853-69. He traveled extensively and wrote many books, including "Life of William Penn" (1851), "New America" (1867), and "Free Russia" (1870).

Djibouti (*zhê-bû-té'*), or JIBUTI, chief port and capital of French Somaliland, 150 m. s.w. of Aden on the Gulf of Tadjoura. Founded by the French in 1888, it is important for its harbor, situated near the strait of Bab el Mandeb and at the southern end of the Red Sea, making it a regular port of call for ships to and

from the Far East. It is also the terminus of the railway between Djibouti and Addis Ababa, Ethiopia, and the only outlet for Ethiopia. The city also has a first-class airport. Population, 1954, 31,000.

Dnieper (*nē'pēr*), an important river of Russia, and next to the Volga and Danube the largest in Europe. Its source is in the region of Smolensk, at the foot of the Valdai Hills. It has a southerly course to Kiev, thence makes a bold curve toward the southeast, thence south, and finally southwest, flowing into the Black Sea. The total length is approximately 1,350 m., and it is navigable from a point some distance above the city of Smolensk. Among its principal tributaries are the Pripet, Beresina, and Desna. The government of Russia removed the rocks forming a cataract between Kiev and Alexandrovsk, and otherwise improved it for the enlargement of internal navigation. It also caused the building of numerous canals, among them one connecting the Dnieper with the Dvina, thus making a continuous water route from the Baltic Sea to the Black Sea. The Dnieper is crossed by many bridges, has on its banks numerous commercial centers, and is itself of vast value as a commercial artery. The lower course is noted for valuable fisheries and its lowlands for their fertile "black soil."

The great ferro-concrete *Dnieper Dam* (Dneprostoi Dam), near Dniepropetrovsk, U.S.S.R., was constructed (1927-32) across the river's falls under the direction of American engineers, notably Hugh L. Cooper. Until the construction (1936-42) of Grand Coulee Dam, Washington, this dam was the largest in the world, measuring 2,300 ft. in length and more than 185 ft. in height, and raising the river level sufficiently to permit deep-draft navigation from the mouth of the river as far north as above Orsha. In addition, there was a huge electric power plant, producing annually about 2,000,000,000 kilowatts. During the German invasion of Russia in 1941, it was found expedient to destroy the dam to flood the river against the enemy and to prevent his benefiting from its navigation and power features. Reconstruction of the dam was commenced at the end of the war, however.

Dniepropetrovsk (*nē-prō-pē-trōvsk'*), formerly Ekaterinoslav, the fortified capital town of the government of Ekaterinoslav, U.S.S.R., 250 m. n.e. of Odessa. It is located in the Dnieper Bend, on the Dnieper (*q.v.*) River's right bank, and is the site of a great dam. Manganese, niter, coal, and iron are found nearby. Iron-smelting and metallurgical industries as well as flour mills, breweries, etc., employ many workers. Wheat, wool, cattle, and timber pass through the town from the surrounding region. The Poles built a castle here in 1635, but the city itself, founded by Potemkin (*q.v.*), did not take shape until

1786. Potemkin's residence, a monument to Catherine II, and the cathedral, completed in 1835, are noteworthy sights. Modern prosperity of the city dates from 1895, and more especially from the inauguration of the Russian Five Year Plans.

Dniester (*nēs'tēr*), a large river of eastern Europe, rises in the Carpathian Mts., in north-eastern Rumania. It flows through Russia toward the southeast, passing from near Chotin toward Odessa, near which it flows into the Black Sea, after a course of about 850 m.

Doak (*dōk*), WILLIAM NUCKLES, labor leader, born at Rural Retreat, Va., Dec. 12, 1882; died Oct. 23, 1933. He studied in the public schools and the Southern Business Coll., Bristol, Va., and became a railway trainman. For several years he was editor of *The Railroad Trainman*. In 1930 President Hoover made him Secretary of Labor, as successor to James J. Davis.

Doane (*dōn*), GEORGE WASHINGTON, bishop, born in Trenton, N.J., May 27, 1799; died Apr. 27, 1859. After being graduated from Union Coll. in 1818, he studied law and later theology. In 1821 he was ordained deacon, selected as professor of rhetoric at Trinity Coll. in 1824, and consecrated Bishop of New York in 1832. He founded St. Mary's Hall in Burlington in 1837, and established Burlington Coll. in 1840. A year later he visited England and preached in various places. In 1824 he published "Songs by the Way." His miscellaneous writings and sermons were published by his son, William Crosswell Doane (*q.v.*).

Doane, WILLIAM CROSWELL, clergyman, born in Boston, Mass., Mar. 2, 1832; died May 17, 1913. He was graduated from Burlington Coll. and was ordained a priest of the Protestant Episcopal Church in 1856 by his father, G.W. Doane, who was bishop at Burlington. For some time he assisted his father in St. Mary's Church, Burlington, and subsequently was rector of important churches in Connecticut and New York. He was consecrated Bishop of Albany in 1869, and in 1902 became chancellor for the Univ. of the State of New York. He founded St. Agnes' School for Girls. His publications include: "Epistles and Gospels for the Sundays of the Year," "Mosaics, or Harmony of the Collects," and "Rhymes From Time to Time."

Dobbs Ferry (*dōbz*), a village in Westchester County, New York, 20 m. N. of the center of New York City. It is located on the Hudson River and on the New York Central R.R., at the south end of an expansion in the Hudson known as Tappan Bay. Many New York businessmen reside here. It has a number of fine churches and many modern public utilities. Washington and Rochambeau met in the old Livingston mansion at Dobbs Ferry to plan the Yorktown campaign. Another conference was held at the same place in 1783, between Washington, Clinton, and Carleton, to

consider the withdrawal of British troops from America. Children's Village, a training school for problem children, is located at Dobbs Ferry. Population, 1900, 2,888; 1940, 5,883; 1950, 6,268.

Dobson (*dōb'sūn*), HENRY AUSTIN, author, born in Plymouth, England, Jan. 18, 1840; died Sept. 2, 1921. After studying in England, he studied in Germany with the view of adopting the profession of a civil engineer. However, his inclination was largely toward literature, especially after becoming acquainted with German writers, and he became a frequent contributor of verse and prose to periodicals. His productions embrace many graceful and light forms of drawing-room verse, including adaptations from the French. Later he devoted himself mainly to prose, some of his writings in this line constituting popular works. Among his productions are: "Proverbs in Porcelain," "At the Sign of the Lyre," "Old World Idyls," "Memoirs of Horace Walpole," "Eighteenth Century Vignettes," and "Thomas Bewick and His Pupils." He wrote introductions to various biographies and historical works.

Dock (*dōe*), an artificial excavation or structure for receiving ships to be repaired, loaded, or unloaded, or for safekeeping. There are several classes, the most common being the wet or berthing docks, dry docks, and hydraulic docks. *Wet docks* are intended for loading and unloading vessels afloat. They are made either by excavations near the shore, or by constructing walls of timber or solid masonry. The latter kind is used where tides cause material changes in the level of the water, the ship entering at the time of flood tide, and, when closed, the water is kept at the desired level. This class of docks provides protection for ships against storms and the action of tides. Modern docks are mostly of concrete rather than of timber.

Dry docks are used to admit vessels to be examined and repaired. They are of such construction that gates can be closed after the vessel enters, when the water is pumped out, leaving the vessel resting on timbers while the shipwrights are engaged on the repairs. A *floating dock* is a form of dry dock. It is sunk below the surface of the water, allowing the vessel to float into it, after which it is raised and the water is pumped out of the surrounding tank. One of the largest floating docks is in New York Harbor. *Hydraulic docks* are likewise a kind of dry docks. They ordinarily have a system of iron columns, each containing a hydraulic press, by means of which the vessel is raised above the surface of the water. The hydraulic presses are worked simultaneously by powerful steam engines. The presses, working on iron pontoons, are first properly adjusted, and the ship is raised and securely suspended above the water by means of girders. After the vessel has been raised and secured in its position,

DOCUMENT

the pontoon may be floated away and used for elevating other vessels, thus furnishing means whereby a number of vessels may be inspected and repaired at the same time.

Wet and dry docks are maintained in all important seaports. They are usually in charge of a dock master, the official who has control and general superintendence. One of the largest dry docks was built in Southampton, England, in 1933. Dockyards are enclosed magazines near harbors, in which all kinds of necessary stores and materials are deposited. Among the principal dockyards of the U.S. are those of New York, Washington, Boston, Pensacola, Fla., Portsmouth, N.H., League Island, Pa., Mare Island, Calif., New London, Conn., and Portsmouth, Va. The dockyards of Canada include those of Montreal, Quebec, St. John, and Vancouver.

Document (*dōk'yū-mēnt*), in history and law, a palpable evidence or proof of a fact or deed. In human history such documents consist mainly of words, written, printed, or carved, and sometimes of depictions (e.g., Egyptian tomb reliefs). The noun document is also applied to objects found in nature, such as a fossil or a geological stratum; an old tree is said to be "documentary" of a period of the evolution of the earth. In a figurative sense, each work of art, each building, and even forms of social order or government may be regarded as documents of their period of origin. Documentary films, cartoons, etc., depict elements taken directly from life without interpretation. Because, however, the subjectivism of the collector enters into the selection and organization of his objects, a certain dramatic element is introduced by the specific choice of social, political, religious, or other backgrounds of such recordings.

Documentary Bill (*dōk'yū-mēn'tā-rī bīl*), in commerce, a bill or draft of exchange accompanied by shipping documents or others, giving evidence of a transfer of values.

Dodd (*dōd*), WILLIAM EDWARD, historian and diplomat, born in Clayton, N.C., Oct. 21, 1869; died at Round Hill, Va., Feb. 9, 1940. He began teaching in 1895 as an instructor of history at Virginia Polytechnic Inst. He joined the faculty of Randolph Macon Coll. in 1900, and nine years later went to the Univ. of Chicago as professor of American history. He became chairman of the department of history at Chicago in 1927, and in 1933 President F. D. Roosevelt appointed him minister to Germany. Dodd's service there was largely marked by protests to the Nazi government, and late in 1937 he resigned. When he returned to the U.S. he lectured extensively on the danger of German aggression and later became active in exposing Nazi propaganda in this country. Dodd was known as the world's foremost authority on the history of the South. Particularly authoritative among his books are "The



Official U. S. Navy Photo

FLOATING DRY DOCK



COMMERCIAL DOCKS IN MIAMI, FLA.

Life of Jefferson Davis," "Statesmen of the Old South," and "Woodrow Wilson and His Work." With Ray Stannard Baker he edited "The Public Papers of Woodrow Wilson." An account of his German experiences was published posthumously in 1941, as "Ambassador Dodd's Diary, 1933-1938."

Dodder (*dōd'dēr*), a genus (*Cuscuta*) of parasitic plants native to the temperate regions. They are leafless, climbing plants, and the flowers grow in dense clusters. The young plant begins in the ground and twines upward, fastening itself to the plant from which it derives nutriment, and later the rootlets become severed from the soil. About 50 species have been classified, including those that are parasitic on hops, flax, clover, alfalfa, nettles, and leguminous plants. Some are injurious to wheat and clover, especially in Europe. About 20 species occur in the U.S.

Doddridge (*dōd'rīj*), PHILIP, nonconformist clergyman and author, born in London, June 26, 1702; died Oct. 26, 1751. He was educated at the theological academy of Kibworth, became pastor of a small congregation in the town of Kibworth in 1722, and a few years later was chosen president

of a new liberal theological school modeled on the academy from which he had been graduated. Doddridge sailed to Lisbon in 1751 to recover his health, but died there soon after his arrival. His principal works include "The Rise and Progress of Religion in the Soul," "The Family Expositor," and a series of divinity lectures in six volumes. He wrote various hymns, of which one of the best-known is "O God of Bethel, by Whose Hand."

Dodds (*dôdz*), HAROLD WILLIS, educator and political scientist, born at Utica, Pa., June 28, 1889. He was graduated in 1909 from Grove City Coll. (from which he received an LL.D. in 1931), and started his teaching career as an instructor in economics at Purdue Univ. (1914-16). During World War I he served as executive secretary for Pennsylvania for the U.S. Food Administration, going, after the war, to Western Reserve Univ. as assistant professor of political science (1919). His steadily growing interest in problems of local government led to his resignation a year later, and to his appointment as secretary to the National Municipal League (1920-28). He was also editor of the *National Municipal Review*, a post which he held from 1920-33, meanwhile lecturing at the Univ. of Pennsylvania and Swarthmore Coll. on municipal government and at New York Univ. on political science.

In addition to these activities, he had been selected in 1922 as electoral adviser to the Nicaraguan government, and had formulated a new electoral law for that nation. Having lectured on politics at Princeton Univ. since 1925, he was appointed a professor there in 1927, and made chairman of the administrative committee of the Princeton School of Public and International Affairs in 1930. He directed a survey of state administration in New Jersey in 1932, and a year later became the 15th president of Princeton. In line with his continuing interest in public affairs, he served as chairman of the U.S. delegation to the Anglo-American conference on the refugee problem held in Bermuda in 1943. The author of "Out of This Nettle . . . Danger" (1943), he has also written numerous articles on government administration.

Dodecanese (*dô-dêk-â-nēs'*), a group of islands off the southeast coast of Asia Minor, at the entrance to the Aegean Sea. The main islands, with modern Greek and Italian (in parentheses) names, are Astypalaia (Stampalia), Kalymnos (Calino), Karpathos (Scarpanto), Kasos (Caso), Khalke (Calchi), Kos (Coo), Leros (Lero), Lipso (Lisso or Lipso), Nisyros (Nisiro), Patmos (Patmo), Syme (Simi), and Telos (Piscopi) as well as Rhodes (Rodos in Greek and Rodi in Italian), under Greek control. Rhodes, the capital city (on the island of Rhodes), is associated with the famous Colossus, a statue of Apollo, one of the seven wonders of the ancient world. (See also

color plate, *Seven Wonders of the World VI*, in vol. XI.) Epicharmos, the poet, and Hippocrates, the father of medicine, resided on the island of Kos. The islands were Greek from prehistoric times, but were ruled successively by the Romans, the Byzantines, the Venetians, and the Knights of St. John of Jerusalem; from 1522 until 1912 they formed part of the Turkish empire. They were taken by Italy in 1912, during the war with Turkey. Three other Aegean islands, Khios, Lesbos, and Samos, however, remained in Greek hands. Although Italy promised (Treaty of Lausanne, 1912) to relinquish the Dodecanese to Greece, her hold on them was recognized by the secret treaty of London (1915). They were formally awarded to Italy by the Treaty of Sèvres (1920, the first, but unratified, peace treaty with Turkey after World War I). Occupied by German troops after Italy's capitulation in World War II, they were restored to Greece with the exception of Rhodes, which had already reverted to Greece in 1945, in 1947 by the Paris Conference of Foreign Ministers (1946). Formal annexation occurred in 1948. Extensive agriculture is carried on as well as production of carpets, pottery, olive oil, sponges, tiles, and wines. Population, about 125,000.

Dodge (*dôj*) **City**, county seat of Ford County, Kans., on the Arkansas River. A trade center for an important wheat and stock-raising region, it manufactures agricultural machinery and wood and canvas products. It was long famous as the "cowboy capital" of the Old West. Population, 1940, 8,437; in 1950, 11,262.

Dodge, GRENVILLE MELLE, soldier and civil engineer, born in Danvers, Mass., April 12, 1831; died Jan. 3, 1916. He studied at Norwich Univ., Vermont. In 1854 he was engaged by the government as railway surveyor along the Platte River, and at the beginning of the Civil War joined the Federal Army. In 1862 he commanded a brigade at Pea Ridge, and two years later was made major general of volunteers for valuable service at Sugar Valley and Resaca. He succeeded Gen. Rosecrans in command of the department of Missouri, and after the war was chief engineer of the Union Pacific R.R. and later of the Texas Pacific R.R. He was Republican Congressman from Iowa, 1867-1869, and for many years was engaged in building railroads, especially during a lengthy association with Jay Gould (*q.v.*). In 1898 he became president of the commission created to investigate charges of mismanagement in the Spanish-American War.

Dodge, MARY ABIGAIL, author, pseudonym, GAIL HAMILTON, born in Hamilton, Mass., in April 1830; died at Wenham, Mass., Aug. 17, 1896. She was instructor of physical science in the Hartford, Conn., high school, and later became a governess at Washington, D.C., in the family of Gamaliel Bailey, who was editor of the *National Era*. She



CHARLES DODGSON

became a regular contributor to that periodical and later was one of the editors of *Our Young Folks*. She was closely related to the wife of James G. Blaine and wrote a biography of Blaine. Among her many other writings were "Country Living and Country Thinking," "Gala Days," "Woman's Worth and Worthlessness," "The Battle of the Books," and "Woman's Wrongs: A Counter-Irritant."

Dodge, MARY ELIZABETH MAPES, author of juvenile books, born in New York City, Jan. 26, 1831; died in Onteora Park, N.Y., Aug. 21, 1905. As a young woman, left a widow with two sons to support, she started work as an editor of *Hearth and Home*. In 1873 she became the editor of a new monthly, which she named *St. Nicholas*, attaining much success in that capacity. A number of her productions have been translated into various languages and published in several European countries. Her best-known work is "Hans Brinker; or The Silver Skates," which won a prize from the French Academy, and is still a popular juvenile. Among her other books are "Donald and Dorothy," "When Life Is Young," "Land of Pluck," "Theophilus and Others," and "A Few Friends."

Dodge, WILLIAM EARLE, philanthropist, born in Hartford, Conn., Sept. 4, 1805; died in New York City, Feb. 9, 1883. He entered business in New York in 1826 as a manufacturer and importer, and achieved much success in these enterprises. Later he became interested in benevolent and religious institutions, contributing large sums for the establishment of the Protestant Coll. at Beirut, Syria. In 1861 he was a member of the peace convention held at Washington, D.C., and served as a Republican member of Congress, 1866-67. He was an organizer of the Y.M.C.A. in the U.S. A statue was erected to his memory at Hartford two years after his death.

Dodgers (*dō'jērz*), the nickname of the

DOENITZ

Brooklyn baseball team of the National League. The Brooklyn team's fans, from the area around the first ball park where newly installed trolleys had caused a number of traffic accidents, were nicknamed the "Trolley Dodgers." Shortened to "Dodgers," the name was later applied to the team itself, since 1957 playing for Los Angeles.

Dodgson (*dōj'sūn*), CHARLES LUTWIDGE, pseudonym, LEWIS CARROLL, mathematician and author, born in England, in 1832; died Jan. 14, 1898. He was graduated from Oxford in 1854, where he was a lecturer for 20 years, beginning in 1855, and in 1861 he was ordained a minister. His writings, under his pseudonym, were largely for children. It is said that in his latter days he expressed the fear that his mathematical works would be obscured by his books of grotesque humor. Among his productions in mathematics are "Guide to the Mathematical Student," "Formulæ of Plane Trigonometry," and "Syllabus of Plane Algebraical Geometry." His books for general reading include "Alice's Adventures in Wonderland," "Through the Looking Glass," "Hunting of the Snark," "A Tangled Tale," and "Phantasmagoria and Other Poems."

Dodo (*dō'dō*), a large bird that became extinct about two centuries ago. It inhabited Mauritius, an island in the Indian Ocean east of Madagascar. Writers class this bird with the pigeon, although it was an extreme modification of that type. It had strong but ill-shaped legs, functionless wings, and a clumsy aspect, and the upper mandible was hooked like that of a bird of prey. The plumage was hairlike. In size and weight the dodo was larger than a swan. Its extinction was caused by its inability to fly and the excellence of its flesh for food.

Dodona (*dō-dō'nā*), an ancient city of Epirus, in Greece, about 11 m. s.w. of the site of modern Janina. It was located near Mt. Tomarus, surrounded by rugged hills, and was the seat of an ancient oracle dedicated to Zeus. The priestesses received their communications by listening to the rustling of the leaves of an oak tree, which was supposed to be the seat of the deity. In 1887 extensive excavations were made, and an acropolis and the temples of Zeus and Aphrodite were located.

Doe (*dō*), JOHN, and **Roe** (*rō*), RICHARD, in law, imaginary or assumed names used to denote an unknown party in a court action.

Doenitz (*dō'nitz*), KARL, German naval officer, born in Mecklenburg in 1892. Coming from a family of landowners and shipowners in Germany's Baltic province, he entered naval service at the age of 18. During World War I he served on surface craft and later commanded two U-boats in the Mediterranean. In the interim between the two wars, Doenitz was responsible for the rebirth of the German submarine service in violation of the Versailles Treaty. He initiated

many new techniques for building underseas craft, particularly the spare-parts system which permitted the Germans to keep a large fleet in packing cases ready for assembly when the Nazis were ready to flout the Versailles Treaty openly. In World War II Doenitz developed the technique of undersea warfare known as the "wolf-pack," in which a group of U-boats instead of the single raider attacked convoys. Late in the war he supplanted Adm. Erich Raeder as head of the German navy, and after the death of Adolf Hitler (1945), he headed the Nazi government which accepted the unconditional surrender terms of the Allies. Doenitz was one of the German leaders indicted as major war criminals for trial before the International War Crimes Tribunal in Nuremberg, Germany. On Oct. 1, 1946, he was sentenced to 10 years in prison.

Dog (*dōg*), mammal of the genus *Canis*, more especially a domesticated carnivore known as *Canis familiaris*, as differentiated from the wolf, *Canis lupus*, and from the jackal, *Canis aureus*. There are two schools of thought as to the origin of the dog. Some attribute its ancestry to a single breed from which sprang the various types known throughout the world today, and some to several distinct ancestors, peculiar to certain regions of the world. The common wolf, known to have existed in prehistoric times in Europe, where evidences of the first domestication of the dog are found, is widely credited with being the sole progenitor of the dog. It has been noted, however, that domesticated dogs frequently bear a resemblance to wild dogs native to the regions in which they abound, e.g., the Eskimo dog resembles the North American wolf, the pariah dogs of the East are closely akin to the jackal, African jackals resemble the tame dogs of that continent, the prairie wolf and Hare Indian dogs are somewhat alike in appearance, etc. This fact may be used to explain either theory of the dog's origin: that of multiple ancestry or that of origin from a single wild source, it being known that dogs accompanied man in his early wanderings over the globe, interbreeding freely with wild animals in specific areas.

Although it is known that dogs were domesticated in Europe as early as the New Stone Age and in the succeeding Bronze and Iron Ages, not until historic times do we have any record of their actual appearance or of specific types. Ancient Egyptian monuments of about 4000 B.C. testify to the existence of several distinct breeds, including a slender, long-legged type and a smooth-haired, short-legged breed. In ancient Chinese art, dogs were idolized. Evidences of the existence of the toy Italian greyhound go back over 2,000 years. The Hungarian komondor traces its ancestry more than 1,000 years back. The progenitors of the Chihuahua played a sacrificial

part in the religious services of the Toltec tribes and Aztecs of Mexico. The Afghan hound also traces its ancestry back several thousand years. In Assyria, about 600 B.C., dogs somewhat resembling mastiffs were depicted and the early Greeks and Romans had dogs of various types.

The early peoples are believed to have utilized the dog in hunting, though it is known that they also ate the flesh (a practice still observed in some places today). That dogs also became pets seems a certainty, since even the Australian aborigines, considered the most backward of peo-



BASALT FIGURE OF A DOG

Egypt, 3rd century B.C.

ples now extant, become closely attached to the wild dingos which they domesticate.

Since the earliest time of their domestication, dogs have worked for man: as hunters, watch-dogs, sheep or cattle dogs, etc., functions still performed today. The pointers, setters, and spaniels are used to hunt game; bloodhounds, bassets, and foxhounds may be utilized to track animals, or even people, with their keen sense of smell; whippets and greyhounds are trained as racing dogs; terriers rout small game from rocks and cliffs; the German shepherd, Doberman pinscher, and other dogs are used in police work and by the military; the Bedlington terrier and mastiff were formerly trained to fight in pits, though this practice is now frowned upon; the sheepdogs herd sheep and tend the flocks; the Alaskan malamute, Eskimo dogs, and the Samoyede are working dogs, pulling sleds or small carts; the St. Bernard is noted for its rescue work in mountain snows, while the Newfoundland



ENGLISH SETTER



Courtesy Mrs. Myron C. Gelrod, Hollis, N. Y.
DACHSHUND "Hansel aus der Nachthöhle"

has been trained to effect rescues at sea. Most dogs serve as watchdogs. Some are trained for theatrical and exhibition purposes. Most recent, and one of the most humanitarian, of dog's duties is that of the "seeing eye" dog. Only the most intelligent dogs (of a few breeds) are selected for this service of guiding the blind. Almost all dogs, regardless of their duties, make lovable pets.

Dogs vary greatly in size, some being only a few inches high while others attain a height of 2 to 4 ft. They are variously colored, have variously shaped heads, ears, and limbs, and differ greatly in the length and texture of hair. The question of cataloguing dogs according to breed or type is one involving much controversy. An ancient Roman classification gave three varieties: fighters, wise dogs, and swift-footed dogs. Another grouping of ancient times was into house dogs, sporting dogs, and sheep dogs. Generally accepted today is the following grouping:

SPORTING DOGS

Griffons (Wirehaired Pointing)	Setters (Irish)
Pointers	Spaniels (American Water)
Pointers (German Short-haired)	Spaniels (Brittany)
Retrievers (Chesapeake Bay)	Spaniels (Clumber)
Retrievers (Curly-Coated)	Spaniels (Cocker)
Retrievers (Flat-Coated)	Spaniels (English Springer)
Retrievers (Golden)	Spaniels (Field)
Retrievers (Labrador)	Spaniels (Irish Water)
Setters (English)	Spaniels (Sussex)
Setters (Gordon)	Spaniels (Welsh Springer)
	Weimaraners

HOUNDS

Afghan Hounds	Foxhounds (English)
Basenjis	Greyhounds
Basset Hounds	Harriers
Beagles	Norwegian Elkhounds
Bloodhounds	Otter Hounds
Borzoi	Salukis
Dachshunds	Whippets
Deerhounds (Scottish)	Wolfhounds (Irish)
Foxhounds (American)	

WORKING DOGS

Alaskan Malamutes	Kuvasszok
Belgian Sheepdogs	Mastiffs
Bernese Mountain Dogs	Newfoundlands
Bouvier des Flandres	Old English Sheepdogs
Boxers	Puliks
Briards	Rottweilers
Bull-Mastiffs	Samoyedes
Collies	Schnauzers (Giant)
Doberman Pinschers	Shetland Sheepdogs
Eskimos	Siberian Huskies
German Shepherd Dogs	St. Bernards
Great Danes	Welsh Corgis (Cardigan)
Great Pyrenees	Welsh Corgis (Pembroke)
Komondorok	

TERRIERS

Airedale Terriers	Manchester Terriers
Bedlington Terriers	Norwich Terriers
Border Terriers	Schnauzers (Miniature)
Bull Terriers	Schnauzers (Standard)
Cairn Terriers	Scottish Terriers
Dandie Dinmont Terriers	Sealyham Terriers
Fox Terriers (Smooth and Wire)	Skye Terriers
Irish Terriers	Staffordshire Terriers
Kerry Blue Terriers	Welsh Terriers
Lakeland Terriers	West Highland White Terriers
Lhasa Apsos	

TOYS

Affenpinschers	Papillons
Chihuahuas	Pekingese
English Toy Spaniels	Pinschers (Miniature)
Griffons (Brussels)	Pomeranians
Italian Greyhounds	Poodles (Toy)
Japanese Spaniels	Pugs
Maltese	Toy Manchester Terriers
Mexican Hairless	Yorkshire Terriers

NON-SPORTING DOGS

Boston Terriers	French Bulldogs
Bulldogs	Keeshonden
Chow Chows	Poodles
Dalmatians	Schipperkes

Dogs are subject to various diseases and afflictions, which may be generally classified as follows: poisoning; infectious, organic, constitutional, and parasitic diseases. Like most domes-

tic animals, dogs may develop mange. Distemper is a contagious disease of young dogs. Rabies, or hydrophobia, is an infectious disease, especially dangerous both to the animal and to a human whom he may infect by his bite. See *Hydrophobia*.

Wild dogs, existing largely in southeastern Asia and Australia, are believed to be descended from the jackal. However, they resemble the dog in appearance, rather than either the jackal or wolf, and are, therefore, treated here. Wild dogs are similar in appearance, regardless of habitat, with long, coarse hair, reddish in summer, lighter in winter. They hunt in packs, more often in the daytime than at night, and maintain families in caves or hollow trees.

The best known of the wild dogs, the Indian wild dog, inhabits the Himalayas, Tibet, and Northern India. The dhole, allied to the Indian wild dog, lives in southern India. In the Malayan peninsula, and in Java, Sumatra, Borneo, and surrounding islands, is found the Malay wild dog, similar in habits to the Indian wild dog. In the Siberian wastes of northern Asia, is the Siberian wild dog, which subsists largely on deer.

The dingo (*q.v.*) of Australia is sometimes considered a separate genus. But, though it lives only in Australia, it bears a close resemblance to the wild dog of the Himalayas.

See also separate articles on individual dogs such as *Airedale Terrier*; *Collie*, and *Color Plates, Types of Dogs I and II*, Volume IV.

Dogbane (*dōg'bān*), a perennial plant native to North America, found in open barren places from Canada to Alabama. A large number of species have been classified, including both herbs and shrubs. The common dogbane grows to a height of 2 ft., has a smooth stem, ovate leaves, pink flowers, and milky juice. It is valued for its medical properties, obtained chiefly from the bark of the root. The Indian hemp, a species quite common in Canada, yields a flaxlike fiber used by the Indians in making utensils.

Dog Days, a period of about 40 days identified by the ancients as the hottest season of the year, which occurred at the time Sirius, the dog star, rose in conjunction with the sun, about July 1. Owing to the precession of the equinoxes, the time is now different, and is usually counted from July 3 to Aug. 11, the time being 20 days prior to the heliacal rising and 20 days after. The ancients looked upon the period of heliacal rising as having an evil influence on the earth.

Doge (*dōj*), from the Latin *dux* meaning leader, title of the highest ranking magistrate of the republics of Venice and Genoa. The first doge of Venice, Paolo Lucio Anafesto, was elected in 697. In the 11th century the power of the doge was restricted by the foundation of a

senate. In 1172, the Great Council (Maggior Consiglio) of 480 members was created, a sort of parliament which gradually assumed more and more administrative control.

The first doge of Genoa, Simone Boccanegra, was elected in 1339. His power was later restricted by constitutional changes.

Doge's Palace (*dōj'ez pāl'is*), the famous building in Venice along the Piazzetta, the residence of the doges, several times destroyed and rebuilt. The present facade was erected in the Gothic style at the beginning of the 15th century. The palace is especially famous in the history of architecture since the highest story is heavier than the arcades of the two lower stories, a quite unusual proportion. After the Gothic period, many other parts, such as the courtyard, etc., were added by famous Renaissance architects, and the interior was richly decorated. The famous Venetian painters of the 16th century, Titian, Paolo Veronese, and Tintoretto, adorned the interior with cycles of paintings.

Dogfish (*dōg'fish*), a species of fish allied to the shark and noted for its voracious and destructive habits. It is common near the American coast, especially off Massachusetts, and in the oceanic waters of Europe. Its characteristics include more or less spotted skin, blackish-brown color, length from 3 to 5 ft., and rough skin in some species. Its weight varies from 6 to 25 pounds. Some species are valued as food, but the fish is caught mostly for its oil.

Dogger Bank (*dōg'gēr*), a large sand bank near the middle of the North Sea, about midway between Denmark and England. It is about 50 m. wide and 175 m. long, extending in a northeast and southwest direction. Near the coast of England it is about 50 ft. below the surface of the water and the general depth is less than 120 ft. Important cod-fishing grounds extend across the Dogger Bank. An important naval battle of World War I took place near here on Jan. 24, 1915, between British and German squadrons.

Dogma (*dōg'mā*), a Greek word, meaning a governmental decree or edict. In the Greek translation of the Bible the word is sometimes used to describe certain elements of the Jewish law. Generally the word dogma is used to designate a supposition which need not be proved, a commonly accepted belief, or an established opinion.

More frequently the term is used in a more specific sense, defining the axioms of the Christian religion, in particular of the Roman Catholic Church. In the teachings of the Catholic Church, a dogma is an intrinsic article of faith to be accepted without doubt or skepticism by all members of the Church. As the Church represents God on earth, a dogma of the Church has the same weight as the teachings of the Bible.

In the early Christian period there were many

heresies and divisions which arose more often than not from the almost complete lack of a common vocabulary of philosophical and psychological terms. Dogmas have been defined to defend a commonly accepted but not concisely expressed belief which some believers would express erroneously, or to bring out into clearer focus a belief commonly held. The main topics of discussion, even of controversies, in the Councils of the Church, dealt with whether specific beliefs, *e.g.*, the divinity of Christ (*q.v.*), or the Immaculate Conception (*q.v.*) were to become dogmas of the Church. During the Middle Ages, when the Church was sovereign in all questions of knowledge, the science of the dogma was the main topic of studies. This explains the constant controversies between the various Catholic philosophies. Scholasticism (*q.v.*) dealt essentially with problems and contents of dogmas.

The history of dogmas clearly reflects the development of the Christian religion and philosophy. For the early Christian church, contents of dogmas derived immediately from the New Testament. Between the years 300 and 700, the Councils of the Church further defined the contents of the various dogmas. However, at that time the distinction between a dogma and a "doctrine," as an essence of belief, had not yet become quite clear. In the Middle Ages scholastic philosophy and theology defined the dogma more and more clearly. In reaction to the Reformation, the emphasis on the dogmatic character of Catholicism—in contrast to Protestantism—was stressed even more.

Orthodox sections of Lutheranism and other Protestant movements, however, also considered questions of dogma of importance.

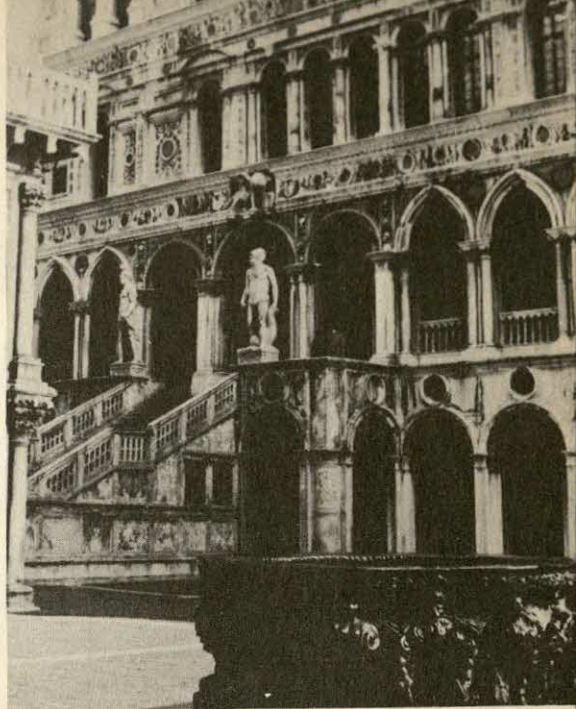
Dog Star. See *Sirius*.

Dogtooth Violet or DOG'S-TOOTH VIOLET. See *Violet*.

Dogwood (*dōg'wōd*). See *Cornel*.

Dohnányi (*dō'nā-nỹi*), ERNST VON, pianist and composer, born in Pressburg, Hungary (now Czechoslovakia), July 27, 1877; died in New York, N.Y., Feb. 9, 1960. In Budapest he was director of the Royal School of Music, conductor of the Hungarian Philharmonic Society, and director of music for the Hungarian State Radio. He fled to the U.S. in 1949 and later taught music at Florida State Univ. Two of his best-known works are his "Suite in F-sharp Minor" (1909) and "Variations on a Nursery Theme" (1913).

Doisy (*dōi'sy*), EDWARD ADELBERT, biochemist, born in Hume, Ill., Nov. 13, 1893. After receiving his Ph.D. from Harvard in 1920, he taught at Harvard Medical School, later at Washington Univ. School of Medicine, and then at the St. Louis Univ. School of Medicine, where in 1924 he was made chairman of the department of biochemistry. Doisy is well known for his work on



Courtesy Italian Arte Tourist Office

DOGE'S PALACE, COURTYARD

blood buffers, isolation of various female sex hormones in crystalline form, and for his synthesis of two types of vitamin K. His work in the latter field won for him the 1943 Nobel Prize for physiology and medicine (with Henrik Dam).

Doldrums (*dōl'drūmz*), a belt around the earth in the vicinity of the equator, characterized by low atmospheric pressure. Over the oceans the doldrums are largely characterized by frequent rains, often of the thundershower type, and variable winds ranging from calm to squalls. Over the continents the winds and weather of this region are controlled by local terrain effects, and vary from place to place.

The existence of this low-pressure belt is associated with the greater amount of solar energy absorbed by the atmosphere of the tropical regions compared with the atmosphere of higher latitudes. The doldrums shift their position north and south during the year, lagging approximately six weeks behind the region of maximum insolation. In July (the Northern Hemisphere summer) the doldrums reach an average maximum latitude of approximately 10° N. while in January (the Southern Hemisphere summer) the belt moves only a few degrees south of the equator.

A large proportion of tropical cyclones originate over oceanic areas where the trade winds and doldrums merge.

The word doldrum originated in the days of sailing ships when ships were often becalmed for long periods of time in the equatorial regions. See also *Storm*; *Whirlwind*; *Wind*.

Dole (*dōl*), aid to the unemployed, distributed



Wide World Photo

DOLLS MIRROR THE AGES

The fashions of 1775 through 1925 are worn by this group. The years represented are (left to right) 1775, 1875, 1800, 1900, 1825, 1925, and 1850

from public funds. The term refers principally to such relief payments made by the British government during the depression of the 1930's.

Dole, NATHAN HASKELL, editor and author, born in Chelsea, Mass., Aug. 31, 1852; died May 9, 1935. After studying in his native town, he attended Harvard Univ., from which he was graduated in 1874, and taught school in Massachusetts. Subsequently he became a writer and journalist, and was for some time connected with newspapers published in Philadelphia and other cities. He later worked for publishing houses. He translated from Tolstoy and others, and edited "The Rubáiyát of Omar Khayyám." Original works from his pen include "The Hawthorn Tree and Other Poems," and "Omar the Tent-Maker."

Dole, SANFORD BALLARD, jurist, born in Honolulu, Hawaii, April 23, 1844; died in Honolulu, June 9, 1926. The son of an American missionary, he was educated in Honolulu and on the mainland and admitted to the Massachusetts bar. He practiced law in Honolulu and was a judge of the supreme court of Hawaii (1887-93). As president of the provisional government of 1893, he played a prominent part in the overthrow of the monarchy of Queen Liliuokalani (*q.v.*). He became president of the Republic of Hawaii, founded in 1894. When Hawaii became a territory of the U.S. in 1897, Dole was appointed governor by President McKinley. Serving from 1900 to 1903, he resigned to become judge of the district court for Hawaii. See also *Hawaii*.

Dolichocephalic (*dōl-i-kō-sē-jāl'ik*), term used in anthropology to signify races and indi-

viduals showing a skull in which the diameter from side to side is less in proportion to the longitudinal diameter than 8 to 10. See *Brachycephaly*.

Doll (*dōl*), a toy figure, usually representing a child, infant, or adult. The doll is as old as the human race, and dolls have been used as playthings for many years. The study of dolls leads into such complex fields as history, ethnology, archaeology, religion, geography, art, ceramics, costume design, politics, and current events.

Dolls have been made of rag, bone, clay, ceramics, cornhusk, nuts, straw, chintz, worsted, papier-mâché, bisque (unglazed ceramic ware), wax, china, composition, plastic, rubber, and Latex. Each decade brings forth something new in their manufacture.

In early Egypt there were clay dolls which were created with much artistry to represent a deceased person, his or her servants, court attendants, and associates. They were buried with the dead person.

An ancient festival of dolls is still held each March in Japan. Figures of the emperor and empress and their entire retinue of court attendants, including their musicians, are shown. These dolls are generally carved, but are sometimes made of composition; all are handsomely gowned.

In mid-19th-century France the "French fashion doll," made with a head of bisque and a kid body, flourished. This doll was sent from court to court in Europe, displaying fashions from Paris. Dolls of this type were equipped with trunks filled with magnificent, handmade clothing for all hours of

the day or evening. Miniature jewelry, shoes, combs, toilet articles, gloves, and other accessories were included. Such dolls were actually the forerunners of the live fashion models of today, and as far back as 1396 it is noted that the tailor of Charles VI received "459 francs for a doll's wardrobe."

Germany was long known as the doll center of the world. Many of the early German dolls are collectors' items today, especially those of china, papier-mâché, and wax, showing exquisite coiffures molded into the heads. A well-known type made in Germany was the china-head doll upon whose little chest appeared such names as "Ethel," "Marion," "Bertha," "Agnes," "Helen," "Dorothy," and others. The Parian-head doll, with a head made to represent Parian marble, was another type which came from Germany and France, and which today is rare and costly. The magnificent headdresses of luster ribbons, colored plumes, and exquisite ruffles of blue and gold characteristic of this doll reveal the fine craftsmanship that existed in the early days of doll-making.

Most of the early types of doll heads, bodies, and dresses were made to represent the adult. In 1844 the French firm of Jumeau, one of the finest doll manufacturers of the day, created a "*Bébé*" doll which won many academy awards. In America, L. Greiner secured (1858) the first U.S. patent for an "unbreakable" head. Another famous doll was the kewpie, entirely of German bisque, created and designed by Rose O'Neill, artist and writer.

One of the first famous international dolls came into the world in 1917 with a specific reason. The Helena Paderewski doll named for the wife of the pianist, Ignace Paderewski, (*q.v.*), and accompanied by a booklet written in English, was sold to raise funds for Polish refugees in Paris. Each doll was made of cloth and dressed in a fashion of one of the various districts in Poland. Mechanical dolls, produced in France and Germany for several centuries, have been made in America for many years, particularly in the period between 1870 and 1900. Early American dolls included a doll which rode upon a tricycle, patented in 1870, and a seamstress at a sewing machine. In 1890 the Edison doll, created on the same principle as the phonograph, was patented. By means of wax records this doll recited prayers and sang songs. Other singing dolls had Swiss music boxes inside their bodies to provide the melodies. Many new types of mechanical dolls have been invented since 1900 and there are now walking, talking, and acrobatic dolls on the market.

Many doll collectors' clubs have recently been organized, and there has been a concerted effort to gather together in collections dolls of many

countries. The United Federation of Doll Clubs, through various publicity media, has stimulated thousands to become better acquainted with their neighbors by the use of dolls. Many countries are now making dolls to represent their people, their lands, their costumes, and customs. With very few exceptions, such as Central America and outlying districts of the world, these countries are exporting dolls made of wood, cloth, felt, and papier-mâché, and the dolls are finding their way into stores, pictures, and collections representing the places they have been created in and for. Many missions in South America and the Far East, as well as the Balkan States, are creating and selling dolls to help the destitute of their areas. The dolls are sold through American religious orders and missionaries, and the funds thus gained are sent back to the missions for the specific purpose of rehabilitation. Some of these dolls are crude in creation, but most are representative of fine workmanship in face, figure, and clothing.

America is fast becoming the leading doll center of the world. With the coming of new materials, dolls have become available in greater numbers, and dolls representing racial groups, such as the American Indian; children; well-known persons, such as Shirley Temple, Eddie Cantor, Sonja Henie, the Dionne quintuplets, and Gen. Douglas MacArthur; and fictional characters, such as Alice in Wonderland, are now in the collections and homes of thousands.

Dolls are also being used in hospitals for recreational and therapeutic purposes, and prove useful materials in programs for mental hygiene, cerebral palsy, arts and crafts, and physical rehabilitation.

Dollar (*dôl'lär*), a monetary unit of value equal to 100 cents in the U.S. and Canada. It is coined of silver, but mostly issued in paper notes. The dollar is the smallest denomination of paper money currently in circulation, and the largest issued in silver. Some writers assume the name was abbreviated from Joachimsthaler, a coin circulated in Bohemia (1518); others derive the term from talent, the name applied to a pound of gold in the Middle Ages. The name for the unit is *daler* in Dutch, *thaler* in German. The American dollar was first issued in 1794, modeled on the Spanish milled dollar with which the Continental Congress had promised to pay its obligations, and coined at first in both gold and silver (see *Coinage*). The dollar is the name of the monetary unit of many countries, including China, Ethiopia, Liberia, and British colonies such as Barbados, Hong Kong, Singapore, and Malaya. The abbreviation for the peso, the name of the monetary unit (of 100 centavos) in use in Spain, Mexico, the Philippine Republic, Cuba, and many countries in South America, may be



Courtesy Ewing Galloway, N.Y.

THE DOLOMITES IN ITALY

the indirect source of the symbol for the dollar, \$, since it may have been derived from the P^s used to signify pesos, by superimposing the S over the P. See *Coin*.

Dollar-a-Year Man, a patriot who serves the U.S. government during an emergency as an official or adviser without salary, but who must be paid the nominal sum of a dollar per year since the Federal government is prohibited from employing anyone without compensation. Dollar-a-year men are usually recruited from among industrial executives, technical experts, and top-ranking members of the professions.

Dollar Diplomacy. See *Imperialism; United States*.

Dollart (*dōl'lärt*), a gulf on the northwestern coast of Germany, at the mouth of the Ems River, on the boundary of The Netherlands. It is 7 m. wide and *ca.* 12 m. long, and was formed by inundations of the North Sea. The inundations occurred from the latter part of the 13th century until about 1540. Many villages were destroyed within this period, but some of the land has since been reclaimed for cultivation by the construction of dikes.

Dollfuss (*dōl'fōos*), ENGELBERT, Austrian chancellor, born in Texine, Lower Austria, Oct. 4, 1892; assassinated July 25, 1934. He studied at the Univs. of Vienna and Berlin, later serving in the Austrian army as an officer. A Christian Socialist, he held several moderately important offices before becoming minister of agriculture and forestry (1931). Made chancellor in 1932, he was soon faced with the rising tide of Austrian sympathy for National Socialism and the problem of maintaining Austrian independence of Germany. In his opposition to Adolf Hitler (*q.v.*) he allied himself increasingly with the Austrian Fascist group (under Prince Harthem-

DOLLY VARDEN TROUT

berg, vice-chancellor, 1934-36), and in 1933 assumed dictatorial powers. Although aimed at stabilizing the country, his repressive measures brought about a revolt of the Socialists which flared into a bloody civil war before it was put down. As the result of friendly relations with Benito Mussolini (*q.v.*), Dollfuss appeared to have a good chance of keeping his country independent at the time of his murder by a band of Austrian Nazis who disguised themselves as soldiers and ambushed him in the chancellery.

Döllinger (*dēl'ling-ēr*), JOHANN JOSEPH IGNAZ, theologian, born in Bamberg, Germany, Feb. 28, 1799; died at Munich, Germany, Jan. 10, 1890. He was the son of Ignaz Döllinger (1770-1841), a celebrated German physiologist. After obtaining a liberal education, he received priestly orders in the Roman Catholic Church in 1822, and in 1823 became a teacher of church history and law at Aschaffenburg, becoming professor of church history at the Univ. of Munich in 1826. He entered the Bavarian parliament in 1845, serving as a leader of the party favoring the separation of the church and state. He advocated the abandonment of temporal power by the papacy in 1861, and opposed the action of the ecumenical council (1870) which decreed the infallibility of the Pope. The following year he was excommunicated by the Archbishop of Munich, but remained popular, and was elected rector of the Univ. of Munich. He founded the Old Catholic movement and presided over its congress (1870). His numerous publications include many on the history of religions.

Dolliver (*dōl'iv-ēr*), JONATHAN PRENTISS, statesman, born near Kingswood, Preston County, Va. (now in West Virginia), Feb. 6, 1858; died at Ft. Dodge, Iowa, Oct. 15, 1910. After attending the district schools, he took a preparatory course and entered the Univ. of West Virginia, from which he was graduated in 1876. He was admitted to the bar in 1878, and in the same year moved to Iowa, settling in the city of Ft. Dodge. Here he built up a successful law practice, took an active interest in politics, and was elected to Congress as a Republican in 1888, serving consecutively until 1900, when he entered the U.S. Senate. He was re-elected in 1902 and in 1907. He was mentioned as a prominent candidate for Vice President in 1900 and 1908. He allied himself with the "insurgent" Republicans in 1909 when he opposed the Payne-Aldrich Tariff.

Dolly Varden Trout (*dōl'ē vār'den trout*), a trout or char (*Salvelinus malma*), found in the cold rivers of the Pacific Coast. It is so named because its bright coloring is supposed to resemble that of the clothing of Dolly Varden, a character in Dickens' "Barnaby Rudge." It has a large head and mouth and a stout body, and the sides are marked with round red spots. It is found in

the northwestern part of North America from the northern part of California northward. In Oregon it is called the bull trout.

Dolmen (*dôl'mên*), in archaeology, a kind of primitive tomb-chamber constructed of great upright stone slabs which support a flat stone roof. Such dolmens are found around the Mediterranean, in the British Isles, and even in some places in the Near East. The first dolmens were probably erected during the Neolithic period (*q.v.*) in Europe.

Dolomite (*dôl'ô-mîl*), the mineral calcium magnesium carbonate, $\text{CaMg}(\text{CO}_3)_2$, or the rock composed for the most part of the mineral. It is widely distributed throughout the world. The colors of the rock are various, including reddish-white, brown, and yellowish-white. Pearl spar, so called from its luster, is a crystallized variety. Reddish dolomite contains manganese and cobalt, and brown spar owes its coloring to the presence of iron. Dolomite rock is employed for building purposes. Dolomite is used as a substitute for magnesite as a refractory, because it is more economical. It is a source of lightweight metal magnesium, and it is also used as a blast furnace flux, and in the making of magnesia insulating materials. Large quarries are worked in Vermont, Tennessee, Georgia, and in southeastern Canada.

Dolomites or **DOLOMITE ALPS**, a section in the Alps in N.E. Italy, between the Adige and Piave Rivers, Italy. The name Dolomite applies strictly to only the Fassa, Langkofel, Rosengarten, and Schlern Mts., but is generally extended to the entire Ampezzo Limestone Alps. The region is popular with tourists. The highest peak of the Dolomite Alps is the Marmolada, 10,964 ft. The crystallizing magnesium carbonate found in these mountains is known as dolomite (*q.v.*). Both were named after the French geologist Dolomieu.

In World War I, Italian troops crossed the Dolomite border into Austria in September 1915. In 1917 intensive fighting took place in this region. The Treaty of Versailles (1919) gave Italy the Dolomite Mts. and the entire province of South Tyrol (Venezia Tridentina) up to the Brenner Pass.

Dolores (*dô-lôr'ês*), a river rising in southwestern Colorado, in the northwestern part of the San Juan Mts., and flowing into the Colorado River at Grand County, in eastern Utah.

Dolphin (*dôl'fin*), a species of aquatic mammals belonging to the same family as the porpoises and narwhals. They are distributed widely from the equator to the poles and commonly are found swimming in large companies, their habits being largely gregarious. Their movements are skillful and rapid, and they often display their agility by leaping into the air and then plunging through the water with a playful and rapid mo-

tion. They have been known to attain speeds of over 20 knots.

The snout is sharp and long, and there are numerous teeth in both jaws. There is no organ of smell, however, dolphins being the only mammals having this distinction. A blowhole of a semilunar form is located nearly over the eyes, and they come to the surface at short intervals to breathe. Their flesh is coarse and rank, although it is used as food by savages. Dolphins subsist chiefly on mollusks, fish, and other water animals. Their length varies from 6 to 10 ft. The young are watched with care and anxiety by the females, who suckle them for some time after birth. A species known as the *bottle-nosed dolphin* is most common on the eastern coast of North America, extending southward from New Brunswick. Other familiar species are the *black*

REFORMATIO ANGLIAE

EX DECRETIS REGINALDI
POLI CARDINALIS,
SEDIS APOSTOLICAE LEGATI,
ANNO M. D. LVI.



ROMAE, M. D. LXII.

Apud Paulum Manutium Aldi F.

DOLPHIN

Early printers used the dolphin as an emblem of their craft

dolphin and the *spotted dolphin*. A spiny-finned fish of the *Coryphaenidae* family has also been given the name of dolphin. These dolphins, however, are readily distinguished from the mammals by their bright colors and long dorsal fins. They usually attain a length of 6 ft., and inhabit tropical or temperate waters. Like the mammals, they are gregarious and frequently follow ships for great distances.

Domagk (*dô-măgk'*), GERHARD, chemist, born in Brandenburg, Germany, Oct. 30, 1895. Domagk received his medical degree in 1921, and three years later became a lecturer on pathology at Greifswald Univ. In 1925 he was appointed to the Münster Pathological Institute and in 1927 was also named a sectional director of the I.G. Farben research laboratory. His research centered on an attempt to find chemical sub-

stances capable of combating bacterial infections, and his work led to the discovery of "prontosil," the basis for the famous sulfa drugs which cure certain bacterial diseases. Domagk's discovery, and the research based upon it, produced cures for such bacterial diseases as pneumonia, gonorrhea, and meningitis. In 1939 he was awarded the Nobel Prize for physiology and medicine, but declined the award according to instructions of the National Socialist (Nazi) government.

Dome (*dōm*), a hemispherical, vaulted covering or roof structure of a building. The word is applied more properly to the external part of a spherical roof, while the term *cupola* is used to designate both the external and interior parts. Most domes or cupolas have a circular form, although some are elliptical or polygonal, depending on the figure of the base. A lantern or small dome is usually built at the top of a large dome, and is supported by the framework of the latter. In former times domes were constructed largely in the form of hemispheres of stone masonry, while those of modern construction are largely of timbers covered with a metallic surface protection. However, the newer domes have a framework almost entirely of iron or steel. The Rotunda or Pantheon at Rome, constructed under Augustus, is the largest masonry dome in the world, having an internal diameter of 142 ft. and an internal height of 143 ft. It is still in perfect condition. Other noteworthy domes are those of the Cathedral of Florence, St. Peter's at Rome, St. Sophia at Istanbul, and St. Paul's at London. The finest dome in America is that of the Capitol at Washington, D.C. It is constructed of cast iron, has a diameter of 96 ft. and a height of 180 ft., and is 288 ft. above the base line of the east front.

Domenichino (*dō-mēn-ē-kē-nō*), popular name of DOMENICO ZAMPIERI, painter, born in Bologna, Italy, in 1581; died at Naples, April 15, 1641. After studying first in Bologna under Lodovico Caracci, Domenichino went (1602) to Rome to assist Annibale Caracci in the monumental frescoes of the Farnese Palace, but soon gained fame in his own right. Best known among his works at Rome are the frescoes for the churches of S. Andrea della Valle and S. Gregorio. In 1631 he was called to Naples to decorate its cathedral. Domenichino is a typical representative of the Caracci school. Besides his monumental frescoes he painted altar pieces (e.g., "The Last Communion of St. Jerome," now in the Vatican).

Domesday Book (*dōmz' dā*), the name by which an old record of the lands of England is known. It contains an account of the cadastral survey made in 1085-86 under William the Conqueror. The two volumes, written on vellum, comprise a folio of 382 pages and a quarto of 450 pages. These books contain the names of the chief

landowners, the value and extent of the estates, the kind and value of different personal property, and the names of the tenants. The record was made by a number of commissioners, who canvassed the country, being assisted in the work by the people of different sections. It furnished a basis for the organization of military forces and gave an account of the wealth and population, as well as titles to property. It was given the appellation Domesday, a variation of the word "doomsday" (a day of judgment), as being a final, authoritative source of judgment in these matters. Printed in facsimile in 1783 and 1816, it was converted to metallic plates in 1861. The Domesday Book furnishes a valuable record for the investigation and study of many questions relating to the early history of Great Britain and even today is quoted in lawsuits as an authority.

Domestic Economy (*dō-mēs'tik ē-kōn'ō-mŷ*), also called DOMESTIC SCIENCE or HOME ECONOMICS, the name given in schools and colleges to the study of various phases of homemaking and home care, including such subjects as values and preparation of food, making and care of clothing, methods of laundering, sanitation and family hygiene, care of children, proper home equipment and decoration, and wise spending of the family income. Courses in these and allied subjects are taught in most of the women's colleges and universities in the U.S., as well as in normal schools, special technical, vocational, and trade schools, and in all up-to-date high schools. In many cities the training for homemaking begins even in the intermediate school grades. Domestic economy means the management of a successful home, with the greatest possible ease, dispatch, and economy. Applied to household problems, domestic economy corresponds to the planned management which in a profitable manufacturing plant is expressed through increased production at lowered costs. Today's housewife is learning that she can apply modern production methods to her home, with results as satisfactory to her family as to herself. She can save many hours of time each week by investing in practical, tested, time-and-labor-saving equipment, and then planning her working hours as carefully as any efficient factory manager would do.

This does not mean turning a home into a machine. Homemaking is a business, a profession, and a science—but it is also an art. Among all the arts, it is the one most closely related to human welfare and human happiness. In order to have the time and strength and inspiration needed for the creative side of homemaking, it is essential to organize the physical aspects and lift them above the level of drudgery. To be afraid of a "mechanized" home, to scorn "gadgets," budgets and efficiency schedules, to refuse to take advantage of the discoveries which

modern science, invention, and management research have placed at the service of the home, is to continue living in the horse-and-buggy age of long working hours and exhausting effort. No manufacturer would expect to achieve success if he ran his business without a production schedule, a plan for meeting it, and a balance sheet on the cost of operation. No woman can know the real thrill of homemaking until she has made the pleasant discovery that by merely *taking thought* she can run the house more easily, smoothly, and pleasantly for all concerned, and save money while doing it.

Since no two households have quite the same problems, there can be no ready-made formula which will fit every case, but the basic principles behind any carefully worked-out program can be adapted to the needs of the average home. For this reason it is helpful to keep eyes and ears open for reports on other people's experiences, to watch for articles by homemaking authorities. In the comparatively few years since inventors and efficiency engineers have turned their attention to the home, they have made swift and important progress toward elimination of drudgery. Many of their discoveries have been incorporated in new household aids and equipment; others have led to ingenious labor-saving devices and arrangements built into the modern home—sink garbage-disposal units, for instance, to replace the garbage pail. Any woman can keep abreast of the improvement tide by watching neighborhood or department stores, reading women's publications, following advertisements in magazines and newspapers. This does not mean spending money blindly for anything which comes along, just because it is new. It does mean that each new product should be checked by inquiring into the experience of those who have used it, comparing its cost and advantages with those of similar products, and refusing to dismiss any housekeeping aid as "impossible" in this age of revolutionary scientific and mechanical progress.

This article is keyed to the home with growing children and little or no outside help, because it is here that all problems are most acute. A business girl, however, living in a one-room apartment, will find that the same principles also apply to her. Careful planning will gain for her many more moments for rest, reading, or pleasure, in the few free hours she has each day. Any homemaker who undertakes a serious study of her tasks as they are outlined in this brief summary, and translates her study into practice, will discover that running a house may be actually as interesting and stimulating as any business, a challenge to resourcefulness and organizing ability. Surprisingly often it may prove an open door to the development of unsuspected creative in-

stincts expressed through the medium of various household arts. Even the most monotonous routines can be made to lose their monotony if they are constantly studied to find out how they can be simplified, speeded up, or perhaps eliminated entirely.

THE BUSINESS OF HOMEMAKING. The first step in any constructive program is to survey the field and analyze the needs. The average household, like the average business, has several specialized departments—but there are not many businesses where all the departments have the same manager. That is the problem the housewife must solve. As business manager, production chief, and also 75 per cent or more of the personnel, she has to lay out the plans, develop skills and aptitudes in several widely different fields, report to herself, and carry out her own orders. Obviously she needs the help which it is the function of domestic economy to provide. Once having made up her mind to apply scientific principles to her own household, the chief thing is to *make the start*. After that, few women who have discovered how easy it is to arouse family pride and interest in a really well-run home will ever want to drift back into those old haphazard methods which for so long have made the terms "monotony" and "drudgery" synonymous with "housework."

In the average home the housewife's interests and activities must be spread out over seven general departments: (1) finance, budgeting, wise buying; (2) planning meals, marketing, cooking, kitchen routines; (3) home care, cleaning, decorating, upkeep; (4) care of clothes and household linens; cleaning, laundering, pressing; (5) family and household sewing, mending, darning, making over; (6) child care and training, family health; (7) house repair, upkeep, renovation. Only a large and complex business would require from its chief such a diversity of talents, such a varied fund of information and knowledge, such adaptability, such a combination of ingenuity and imagination with patient attention to details. Success in this complicated undertaking is virtually impossible without careful, intelligent planning. Fortunately, the modern homemaker has at her disposal, in libraries and book stores, really good books covering all these phases of domestic economy. It will be a good investment to buy the ones she finds most helpful, and refer to them often, especially in the early stages of her newly ordered life. No other business would think of operating without at least a few well-chosen technical reference books and trade journals.

PUTTING PLANS ON PAPER. The clipping habit, the filing habit, the notebook habit, and the chart habit are all invaluable aids to the homemaker. Most housekeepers collect cooking reci-



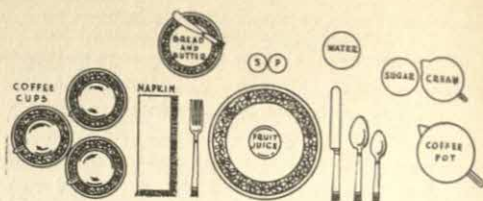
Courtesy Westinghouse Electric Corp., N. Y.

PLANNING IN THE HOMEMAKER'S WORKSHOP

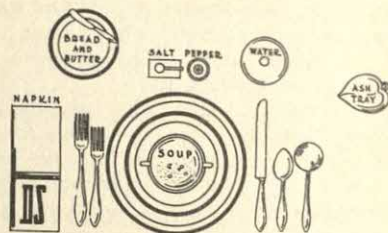
The step-saving pattern used in designing this U-shaped kitchen can be worked out in any medium-sized room. Three work centers are provided, each with its own mechanical "servant" and convenient cabinets and counters. Shadowless illumination speeds the housewife's tasks

pes, but fail to realize that a complete, indexed filing system for their collection is the only way to make it useful. They also fail to profit from the many excellent suggestions they read in today's booklets, advertisements, women's pages, magazines, because they are too "busy" to clip them and file them in alphabetical order for quick reference. In addition to this, it is a good idea to have a small "bulletin board" for posting time-saving hints until after they have been tried out. It is easy to forget to try the new things—but once any method has been tested and found useful it is not apt to be forgotten next time the task comes up. Files, account books, bills, household records, housekeeping and cook books—all should be kept together near a businesslike desk or table fitted up for the house manager's convenience.

A chart of all home activities will help to clarify thinking, also make it much easier to work out a time-saving, labor-saving program. After each operation listed on the chart there should be placed an estimated average of the time required for carrying it out, with space for revised figures representing time cuts following application of new ideas or better methods, or use of improved equipment. In plotting any routine or any operation, three objectives of the household efficiency engineer must be kept in mind: (1) elimination of the waste motion involved in needless steps, bending, reaching, etc.; (2) saving both time and labor by coordinating unrelated phases of the day's work—bedroom cleaning and dishwashing, for example; (3) taking advantage of every possible shortcut when no loss of thoroughgoing efficiency will result. Achieving these objectives in a home not scientifically planned usually involves some rearrangement of storage closets and cupboards,



BREAKFAST COVER FOR HOSTESS

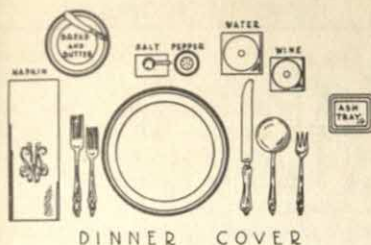


LUNCHEON COVER

SETTING THE TABLE CORRECTLY (I)

relocation of working surfaces, supplies, and equipment, adjustment of old routines. The essence of this planning is never to forget that a straight line is the shortest distance between two points, and that strategic location of working centers, tools, and equipment is as important in the home as in any factory. The newest ideas in household engineering, worked out by experts, are available in booklets put out by various manufacturers of household equipment, usually at no cost except a small fee to cover mailing expense. Announcements of these, in the advertising of the products, are worth watching for.

Having set up an activities-and-time chart, the housekeeper should next check equipment. In each department of housekeeping there are labor-saving devices and equipment which represent a really important investment and must be acquired gradually, in the order of their importance. However, there are also countless inexpensive aids which can be picked up from time to time and should be kept on a reminder list. Each of these may save only a few moments on some daily task, but those minutes may add up to surprising totals at the end of the day. Some of the shortcuts offered by new products or gadgets may seem almost magical compared with older, slower methods. More and more inventions and discoveries are finding their way into our homes. It will be worth while to keep a special file section for them, and try them out. Each one is a very small gamble in itself, and even if a few of them prove worthless, the others will make up for them. In total, they are bound to prove a good investment. In the meantime a fund can be started for additions to major mechanized equipment—self-drying washing ma-



SETTING THE TABLE CORRECTLY (II)

chine, improved vacuum cleaner, dishwasher, deepfreezer, sewing machine, etc., and also the smaller mechanical conveniences such as automatic toasters, electric mixers, and fruit-juicers, self-waxing floor polishers, and pressure canners. The tools already in use in the home should be understood and treated with respect; this will double their useful life.

BUDGETING AND WISE BUYING. The importance of keeping a budget is generally conceded. The envelope system is the easiest, but that is its hazard; it is *too* easy for cash to travel from its own envelope into another. The most generally satisfactory scheme is to buy a well-organized budget book and use its percentages of income as a general guide in plotting expenditures. Wise budgeting includes provisions for insurance, hospitalization, some type of group medical plan—especially if there are children—also the new-equipment fund spoken of above. A page should be set aside in the book, or a section in the files, to keep track of money-saving ideas which are being tried out, and any definite sums known to be saved in this way should be added to the equipment fund.

Some of this fund money can be gained through wiser buying, a subject less generally understood than budgeting. The largest individual savings will be made in the purchasing of home furnishings and clothes for the family. Until the home purchasing agent has made some experiments in the field of carefully planned and intelligent buying, she will have no idea how much money could have been saved over the years—and with greater satisfaction, not less, in the purchases. The first essential is to learn at least the rudiments of recognizing quality



Courtesy Westinghouse Electric Corp., N. Y.

THE LAUNDRY IN THE MODERN HOME

"On-the-spot" lighting, even above the fold-away ironing board, speeds laundry tasks. Automatic washing and drying machines and a convenient mangle whisk all the heavier things through like magic, leaving only special garments for hand care. All units are arranged to minimize fatigue

and values, and then watch reliable stores for genuinely reduced price sales instead of always buying at the peak of the season. At the same time the wary buyer must resist the temptation to load up with unnecessary things just because they are inexpensive. That is *not* wise buying. An important guidepost to value is found in the manufacturers' labels, which tell the consumer just what she is getting and usually how to take care of it. Labels are more than ever important since so many present-day articles are made of synthetics which require special treatment for best results. Filing the labels will save a great deal of time and trouble when time for cleaning comes. In buying upholstered furniture, the customer should insist upon a tag which reveals "hidden values" in fabrics and stuffing. She should examine all wooden parts and all wooden furniture for correct, sturdy construction. Almost any library will provide some book with these details, and illustrations with which she can fortify herself before a shopping tour. It will be time well spent. Shoddy, cheaply made furniture may *look* just as well at first as a piece built for long life and lasting satisfaction. Modern miracles of wearability and time-saving are such products as foam rubber, which never needs repairs and requires no daily beating up to keep cushions in shape; or synthetic upholstery and drapery fabrics, which have all the beauty of traditional textiles but can be kept spotless by wiping with a damp cloth. Also there are soil-resistant glass curtains which dry so quickly that they require no ironing or stretching, and plastic shower curtains which never soften, mildew, nor crack. A few moments spent in figuring the amount of time and money needed every year for keeping textiles clean in the average home will demonstrate the wisdom of a little

additional outlay in the original purchase price of these new materials.

In buying home equipment and tools, every woman knows the advantages many of them offer in saving hours of time every week and lifting her heaviest fatigue burdens, but not everyone realizes their dollars-and-cents value in terms of the service they render. Clothes scrubbed on a washboard, for example, wear out much faster than those correctly washed in an electric machine; carpets and rugs kept really clean with a vacuum hold up much better than when they must take the constant grinding of shoes over grit embedded deep in the pile where no broom or carpet sweeper can reach it; an automatic electric iron not only increases ironing speed but also eliminates danger of expensive scorching; a pressure cooker saves hours of time in the course of a week, at the same time turning out better and more nutritious food, reducing fuel bills, and making it possible to economize with lower-priced cuts of meat. These are only a few examples, but they should make the point clear. Applying this testing yardstick to many household appliances will show savings which will in a short time balance the entire money outlay, leaving all the extra comfort, convenience, time-saving, and long-term money saving as a special dividend for the homemaker.

Wise buying for the kitchen is in a class by itself. Saving money on food is a matter of planning which eliminates waste and turns left-overs into delicious, appetizing, nourishing dishes, rather than of discrimination in buying. In most larger towns and cities it is necessary to shop in a more or less restricted area, paying the prices current there for merchandise of a certain quality. Marked-down fresh food—except at special city or co-operative markets—is usually food which has lost most of its vitamin content through wilting. It is no bargain at any price. For the rest, it is best to look for a reliable merchant who carries brands known to be good, and buy only what is needed for adequate, well-balanced meals. A variety of packaged goods on the pantry shelves means a time-saving reserve if supplies run low between regularly scheduled marketing trips. Except for some special treat, fresh foods should be bought only in season. Ingenuity will usually discover some equally nutritious and tasty substitute for an item which is scarce and high—and the game of finding it is fun as well as being practical. Whenever time is a vital factor, frozen foods are more than worth the slight difference between their cost and that of the same articles in the fresh state. They require no time for preparation, and the fact that there is no waste is a credit item in the cost. Normally, in food purchases, the biggest opportunity for saving money lies in buying

meat. The cheaper cuts are quite as nutritious as the expensive cuts, and equally delicious if the cook knows how to season and prepare them properly, an art which can be acquired by study of a good modern cookbook—particularly one prepared for wartime food shortages. In this connection, it will be well worth while to study the tenderizing properties of vinegar, cooking wines, papaya or lemon juice.

BIRD-EYE VIEW OF HOMEMAKING PROBLEMS.

In each of the several departments there are many recent products designed either to speed up and lighten labor, or to make the results more satisfying. Amazingly fast and effective chemical cleaning agencies of all kinds (including those which eliminate all annoying bathtub rings and film), self-polishing waxes, quick-drying paints, never-failing pest-eradicators, iron-on mending patches and tapes, transparent plastic covers to protect table cloths, tarnish-preventing paper for silver drawers, treated paper "dust cloths" which also polish—the list is constantly growing. When you add to it the array of recent fabrics and materials which are highly resistant to wear, soil, and moisture, easy to keep clean, usually fireproof and vermin-proof, it is obvious that the housewife of the future (*immediate future*), living in a home scientifically designed for saving steps and labor, will be able to give much more time to the mental and spiritual needs of a growing family. In all homemaking departments knowledge is increasing so rapidly that books cannot always keep up with developments. A wise homemaker will therefore consult the works of recognized authorities for basic planning suggestions in each field, then follow the trend of new products in magazines and advertisements, sifting out everything which might be useful to her and testing it by investigation or personal experiment. She will also be on the alert for the hundreds of "tips" or "hints" scattered through all kinds of publications, reporting tricks of the homemakers' trade which involve no new equipment but do lighten daily tasks—simple things born of experience and passed along to help others. Some of them will prove unimportant or of slight value. Others will save both minutes and annoyance. For example: any housewife who has struggled to make a smooth paste by stirring or beating flour into liquid for thickening stews, etc., will be delighted to discover that she can put the flour and the liquid into a closed jar, shake it up well, and pour it out as smooth as cream, without a single lump. Half the time—and many times better results. Dozens of similar tips will add up to easier and pleasanter housekeeping.

HOUSEKEEPING ROUTINES. The actual business of running a house falls into four types of routines, roughly as follows:

DAILY ROUTINES

Airing rooms—making beds—using carpet sweeper—dusting with dry mop—cleaning bathrooms—preparing meals—washing dishes—checking needs—general light dusting—daily kitchen care.

WEEKLY ROUTINES (or Semiweekly)

Cleaning up after weekend—sorting laundry—doing the family wash—doing the family ironing—mending and darning—special cleaning, pressing—thorough vacuum cleaning—thorough dusting—baking day—defrosting, cleaning refrigerator—changing beds—planning meals, and week's activity schedule—cleaning porches.

MONTHLY ROUTINES

Cleaning kitchen shelves, stove, etc.—vacuuming draperies—special cleaning for rugs, upholstery, etc.—washing windows, pictures, mirrors, etc.—airing clothes and bedding—checking closets—cleaning silver, brass—washing bric-a-brac, etc.—waxing floors, furniture, Venetian blinds, etc.

PERIODIC ROUTINES (Quarterly, Semiannually, or Annually)

Complete housecleaning—renovating, when needed—repairing furniture—seasonal cleaning and storage—canning, preserving—cleaning attic, cellar, porches, yard, garage, etc.—putting up (or removing) screens, storm windows, etc.

In any given case, the exact classification of these routines will depend partly upon such factors as the size of the home and the family, the kind of wear the house gets, whether it is located in the comparatively clean country or in some smoky industrial city. Obviously, daily routines will have to be much heavier in homes used all day by active children than in those occupied only by adults who spend much of the time at work away from home, and many periodic routines will have to be repeated at shorter intervals. Items in these check-lists may be shifted from one category to another to suit special situations or individual preference, but it is always important to guard against two arrangements which are equally time-wasting—repeating any operation oftener than is really necessary, and spacing operations so far apart that they finally require double work, with the additional possibility of permanent damage from ground-in soil. Before attempting to work out any time- or labor-saving plan, it is helpful to make a test of the particular routine involved. The test should be started with a watch, a pad, and a pencil in a handy apron pocket. Notes should be jotted down on how long it takes, approximately how many steps it requires, what repairs or supplies are needed to make it easier, tentative suggestions for speeding it up. One very helpful point to remember in planning any cleaning routine is to have several "supply centers" on each floor, so that needed materials are never far from the spot where they are to be used. Once routines have been tested, established, and improved, they should be adhered to—in principle at least—except

for further improvement. They should be flexible enough for adjustment to special occasions or emergencies, but ordinary distractions should not be allowed to upset them. For example: if a child's birthday falls on the Tuesday set aside as the weekly washday, the promised party should be forthcoming and the washday shifted to Monday or Wednesday—but such shiftings should not become a habit. A schedule followed only now and then is not a schedule.

WHEN THE BUSINESS OF HOMEMAKING BECOMES A PARTNERSHIP. Young people like new things, new ideas. Usually it is not difficult to enlist the family's help in a clipping program, especially if they are allowed to assist in the testing or investigation of new equipment, recipes, products, management ideas. They will enjoy "board meetings"—with light refreshments substituted for the directors' \$20 gold pieces—where even the youngest member is encouraged to express opinions. Awards of merit, voted for the suggestions which have turned out to be of most practical value in terms of labor, time, or money saved, will do wonders. Even a prize now and then might help. In some families, each member keeps his own preliminary file. Every so often, duplicates are checked, promising ideas are selected for trial, and items which have been approved by the board are incorporated in the master file. With a system like this in operation, many of the problems of youth and adolescence will fade into the background; it will be surprisingly easy to interest junior members of the firm in sharing home responsibilities as well as home privileges.

Tasks should be worked out, after due consultation "in conference," and assigned to each child, always with due regard to his own abilities and preferences. He should then be made to feel that it is his own special job, to be perfected in every way he can think of, and that he is an essential element in the production line. Remembering that youth may tire of repetition and lose interest, it is a good plan to shift jobs around now and then—a little rivalry between partners may revive flagging enthusiasm. If the partnership principle is seriously applied to every phase of the home, from the timing and working out of daily routines to the excitement of planning new clothes or new furnishings, the word "home" will take on fresh meaning for every member of the family. As for the busy "general manager" of the firm, the term *Domestic Economy* will never again seem to stand merely for dry facts between the covers of a book.

Domestic Relations Courts (*dō-mēs'tik rē-lā'shūns kōrts*), special courts set up by most states of the U.S. to consider cases regarding certain family questions. The courts, variously called children's courts (*q.v.*), courts of domestic

relations, or family courts, have been vested with such jurisdiction as may be necessary for the correction, protection, guardianship, and disposition of delinquent, neglected, or dependent minors and for the punishment and correction of adults who contribute to such delinquency, neglect, or dependency. The courts may also compel the support of a wife, child, or poor relative by persons legally chargeable with their support who abandon or neglect to fulfill such obligations.

Dominance (*dōm'i-nāns*), in biology, the condition in which, when two individuals, differing in one hereditary factor, are crossed, the offspring resemble one of the two parental types, but not the other. If the hybrid is somewhat intermediate, but resembles one of the parents more than the other, dominance is incomplete.

Dominant (*dōm'i-nant*), in music, the fifth note above the tonic, or keynote, in any scale. Its name originates from its use in the ecclesiastical system when it was the principal reciting note in the Gregorian chant. It marks the division of a scale into two coordinate parts, frequently serving as a starting note in the second subject in a sonata.

Dominic (*dōm'i-nik*), SAINT, founder of the Dominican order of monks, born in Calaruega, Old Castile, in 1170; died in Bologna, Italy, Aug. 4, 1221. His early life is surrounded with legends, in which he is described as a child who practiced self-denial and gave evidence of future devotion. He studied for ten years at the university at Palencia. The story is told that he sold his clothes to feed the poor in the time of famine. He accompanied the bishop of Osma to southern France in 1203 to negotiate for Alfonso VIII of Old Castile the marriage of his son to a Danish princess. He thus encountered the Albigenses (*q.v.*), whom the legates of the pope had sought to convert, and he promptly began the work they had given up. He later joined the crusading army sent by the pope to France and had notable success in spreading Christianity. The Dominican order, which he founded in 1215 with 16 followers, received papal sanction in 1216 and in five years spread to most of Europe. Saint Dominic went to Rome in 1216 and devoted the rest of his life to work of the order. See also *Dominicans*.

Dominica (*dōm-i-nē'ka*), an island colony of Great Britain located in the West Indies, one of the Windward Islands (*q.v.*). In the Lesser Antilles, between the French overseas departments of Guadeloupe, on the n., and Martinique, on the s., it has an area of 305 sq. m. Of volcanic origin, it has fertile valleys and rugged mountains; the highest point is Morne Diablotin (5,314 ft.). The residents include many mulattoes, some Negroes, a few whites, and the ca. 400 surviving Carib Indians in the Caribbean. The

island is agricultural, producing chiefly citrus fruits (notably limes) and juices, copra, bay oil, and vanilla. Roseau (pop., ca. 13,000) is the capital. Discovered by Columbus in 1493, Dominica was settled by the French. Long a point of French-British struggle, it went finally to Britain in 1783. It was included in the Leeward Islands until 1940. In 1956 it became part of the British Caribbean Federation (see *West Indies, The*). Population, ca. 65,000.

Dominical Letter (*dō-mīn'i-kal*), or SUNDAY LETTER, in the calendar, one of the first seven letters of the alphabet, used to designate the Sundays that occur during the year. The marking begins with the first seven days of the year, and all the succeeding days of the year are marked consecutively in sets of seven days; hence the 1st, 8th, 15th, etc., of the year are marked by A; and the 2nd, 9th, 16th, etc., by B, and so on. The dominical letter would be the same year after year, if the number seven divided the number of days without a remainder, but since this is not the case, the dominical letters go backward one day every common year and two every leap year. Hence, the series repeat themselves in four times seven, or 28 years. Dominical letters are used in determining the relation between the day of the week and the day of the month in a given year.

Dominican Republic (*dō-mīn'i-kan*), a country in the West Indies, forming with Haiti (*q.v.*) the island of Hispaniola. The Dominican Republic is bounded on the n. by the Atlantic Ocean, on the e. by the Mona Passage (which separates it from Puerto Rico), on the s. by the Caribbean Sea, and on the w. by Haiti. Its length from east to west is about 250 m.; its greatest breadth is 170 m. The country has a coastline of more than 1,000 m. and shares a 193-m. frontier with Haiti. The area is ca. 19,330 sq. m.

DESCRIPTION: A mountainous country, it is crossed by four ranges, which run from east to west and are almost parallel to one another. All four are covered with thick vegetation, especially the heavily forested Cordillera Central, highest mountain range in the Antilles, which bisects the country into virtually equal parts. The largest of the ranges, it contains Pico Trujillo (10,400 ft.), the highest mountain of the West Indies, and Monte Tina (9,236 ft.). The other ranges are the Cordillera Septentrional, in the north, and the Sierra Neiba and the Sierra de Bahoruco, in the south. Among the many fertile central and eastern valleys, the Cibao Valley, situated between the Cordillera Central and the Cordillera Septentrional, is the largest; the country's chief agricultural section, it contains, in the east, the Vega Real (in Spanish, "royal plain"), a highly productive region. Extending

along the Caribbean is the broad southern coastal plain, containing most of the country's chief cities. A number of small islands border the coast. There are many rivers, important chiefly as sources of irrigation; the most important river is the Yaque del Norte.

Rainfall varies considerably, averaging about 53 in. annually in the east, about 82 in. in the extreme northeast, and from 13.7 in. in the southwest to 21 in. in the northwest. The rainy season runs from May to November. Irrigation is necessary for successful farming in many sections, however. The semitropical climate varies little in temperature, with averages ranging from 65° F. to 85° F. in winter and from 73° F. to 95° F. in summer.

AGRICULTURE: The country's economy is based on agriculture. It is a world leader in production and export of sugar, its major export commodity, and sugar production, including both growing and processing of cane, is the leading occupation. Other agricultural items exported in quantity are coffee, cocoa, tobacco, bananas, and molasses. Also cultivated are rice, corn, peanuts, sweet potatoes, white potatoes, coconuts, beans, oranges, plantains, yucca, and pineapples. As part of a program to lessen economic dependence on sugar by diversifying agriculture, there has been increased emphasis on raising livestock, especially beef cattle, but this field is still comparatively undeveloped, as is dairying.

MINING: Until recently mining was of little importance, and exploitation of what are believed to be many mineral deposits is only in the early stages. Currently, mining is limited to iron ore, salt, and gypsum. The country's 10-m. block of almost solid salt (near Barahona on the southwest coast) is thought to be the largest of its kind in the world. The iron ore is of high quality and is the only nonagricultural item of major export importance. Mining of nickel and extensive bauxite deposits was scheduled to begin in 1958. Neither coal, petroleum, nor gas are now produced, but oil exploration was begun in 1956. Most power is generated by burning diesel oil, but a nine-year, \$47,000,000 electric development project, inaugurated in 1956, was expected to make electricity available throughout the country.

COMMERCE AND TRANSPORTATION: Although Great Britain is the principal buyer of Dominican sugar, the U.S. is actually the chief customer for Dominican products and also furnishes most Dominican imports. Machinery, foodstuffs, petroleum and gasoline, cotton goods, and automobiles and other vehicles are notable imports.

The principal rail lines are the privately owned railways of the sugar mills and banana plantations, totaling 748 m. The only public line (in the north central part of the country) is government owned and consists of two branches, one,

61.5 m., the other, 6.8 m. The country has 2,420 m. of roads, of which ca. 800 m. are surfaced. The government is carrying on an extensive road- and bridge-building and port-improvement program.

MANUFACTURING: The chief industrial activity is sugar processing; and food processing, in general, accounts for the largest amount of manufacturing. Other industries include salt mining, rice milling, depulping coffee, processing chocolate, the manufacture of peanut oil, liquors, beer, textiles, shoes, apparel, and cement, printing, sawmilling, and generating electricity. Considerable activity, such as lumbering and the manufacture of furniture, is based on the country's forest areas. As late as 1955, only about 71,000 persons were engaged in industrial activities, and the total sales of Dominican industrial goods amounted to ca. \$165,000,000.

POPULATION: About 65 per cent of the population is of mixed European (chiefly Spanish) and Negro (from the early African slaves) heritage, with some Indian blood, although most of the Indian tribes found here by Columbus in 1492 soon died out. The white population, estimated at ca. 15 per cent of the total, is predominantly Spanish, although European refugees have been permitted to resettle here since 1940. The pure Negro group is estimated at 20 per cent of the total. The official language is Spanish, but there are sizable French and English language groups. Ciudad Trujillo, the capital, located on the southeast coast, is the oldest city in the Western Hemisphere. Other leading cities are Santiago (also called Santiago de los Caballeros), San Francisco de Macorís, San Pedro de Macorís, La Romana, Santa Cruz de Barahona, Concepción de la Vega, and San Felipe de Puerto Plata (usually shortened to Puerto Plata). Population, 1957, 2,693,914.

EDUCATION AND RELIGION: Education is free and, in theory, compulsory for children between 7 and 14. The 1950 census showed, however, that 56.7 per cent of those ten years or older were illiterate. Secondary schools are also maintained, as well as facilities for vocational and teacher training. The Univ. of Santo Domingo, at Ciudad Trujillo, founded in 1538, was the first institution of higher learning in the Americas. The official state religion is Roman Catholicism, but other forms of worship are permitted.

GOVERNMENT: The republic operates under a 1955 constitution. Executive power rests with the president, who is elected by direct, universal suffrage for a five-year term and is eligible for re-election. The legislature, called the congress of the republic, consists of a senate of 23 members and a chamber of deputies of 52 members, all elected for five years. A supreme court heads the judicial system; members of the judiciary are elected by the senate. The country is divided ad-

ministratively into 22 provinces and the National District of Santo Domingo (established in 1955).

HISTORY. Following Columbus' discovery of the island, which he called La Española, meaning "Spanish isle," he founded the colony of Santo Domingo. The center of Spain's power in the New World until the discovery of wealth in Mexico and Peru, it was an embarkation point for such explorers as Ponce de León, Cortés, Balboa, and Pizarro. France, having acquired the western third of the island, gained control of the Spanish colony, which was ceded to it under the Treaty of Basel (1795). Spanish rule was restored in 1808, when the Dominicans, aided by British troops, revolted and captured the city of Santo Domingo. Dominican independence from Spain was proclaimed in 1821, but in 1822 the now independent Haitian government in the west invaded the Dominican republic and retained control until 1844.

The new Dominican government entered upon a period of unrest and instability, ending only when the U.S. Marines occupied the country in 1916—they remained until the adoption of a new constitution in 1924. The administration of the customhouses by the U.S., begun in 1905, was ended in 1941. In 1940 the republic was the first in the Americas to offer land to European refugees from Nazi terror. It declared war on the Axis Powers in December 1941 and joined the U.N. in 1945. General Rafael Leonidas Trujillo Molina, who gained control of the government by a 1930 *coup d'état*, served as president, 1930-38 and 1942-52, and was in reality still dictator even when his brother, Gen. Hector Bienvenido Trujillo Molina was elected, without opposition, to succeed him in 1952 (re-elected in 1957).

Dominicans (*dō-mīn'i-kānz*), a Roman Catholic order of friars, known officially in the Church as the Order of Preachers, founded by St. Dominic (*q.v.*) at Toulouse in 1215. The rules of the order are based on those of St. Augustine. In addition to vowing poverty, chastity, and obedience, the friars observe silence and abstinence from flesh meat. Their special aims are preaching and the study of sacred sciences. In the Middle Ages the order shared paramount influence in the Church with the Franciscans, but in the 16th century the Jesuits achieved the intellectual position formerly held by the Dominicans. Because of the black cloaks worn over their white habits when preaching, the Dominicans became known in England as Black Friars. In France they were known as Jacobins because their first establishment was on the Rue St. Jacques, Paris. The order has given four popes to the Church and many cardinals. Saint Thomas Aquinas was a Dominican. There is a second Dominican order (for contemplative nuns), as well as a third order (tertiary): St. Catherine of Siena and St. Rose of Lima (first

canonized saint of the Americas) were tertiaries.

Dominion (*dō-mīn'yūn*), a term formerly used to designate certain territories within the British empire. They are now self-governing members of the British Commonwealth of Nations (*q.v.*).

Dominoes (*dōm'i-nōz*), a game played by two or more persons, with flat, rectangular pieces of wood, plastic, bone, or ivory. The pieces are usually black with white spots and about half as broad as they are long. They are usually plain black on the back. The face is divided by a line into two square surfaces, each of which is either black or dotted with from one to six, nine, or 12 dots depending on whether the set is a "Double Six" (28 pieces), a "Double Nine" (55 pieces), or a "Double Twelve" (91 pieces), respectively. The standard set has 28 pieces. The game is begun by shuffling the pieces face down. Each player then selects an equal number of dominoes; those left over are set to one side for further use by the players. The person who has drawn the piece which has the highest number of dots puts it down. The next domino played must be one with a number the same as one of the two numbers represented by the first, and the two similar ends are joined. A player goes "domino" when he plays his last piece before any opponent does so. The winner scores the number of points equaled by the dots on the pieces held by his opponent. There are several variations of the game.

Domitian (*dō-mīsh'ūn*), in full TITUS FLAVIUS DOMITIANUS AUGUSTUS, third and last Flavian emperor of Rome, born in Rome, Oct. 24, A.D. 51; killed on Sept. 18, 96; son of Vespasian and brother of Titus (*q.v.*). Noted for his encouragement of literature and the fine arts, Domitian had the Arch of Titus erected, after his accession (81), in commemoration of his brother's victories in Judaea. The first part of his reign was austere (*e.g.*, in his restoration of ancient religious cults) and administratively efficient. Domitian adopted his father's absolutism, however, incurring the hostility of the senate. His strengthening of the upper Danube frontier was successful, but his later military campaigns (86-90) ended in a humiliating peace with Dacia (*q.v.*) which left the middle and lower Danube frontiers unstable. It was suggested that his recall of Agricola (*q.v.*) was dictated by his jealousy of the latter's success. An uprising of the army in Germany (88-89), although suppressed, left the emperor suspicious of all around him. The closing years of his reign were marred by despotism, terrorism—including the persecution of Christians—and political intrigue, which finally resulted in his assassination by a freedman, paid, it was believed, by his own wife.

Don (*dōn*), a large river of European Russia, rising in Ivan Lake, a small body of water in the

region of Tula. The Don flows southward, for some 1,200 m., to the Sea of Azov. It is connected by canal with the Volga navigation system and, as a whole, carries heavy interior traffic. The major tributary of the Don is the Donetz (see also *Donetz Basin*); others include the Manych, Medveditsa, Voronezh, and Sosna rivers.

Donaldsonville (*dōn'ald-sūn-vīl*), capital of Ascension Parish, Louisiana, on the Mississippi River, 64 m. above New Orleans. It is on the Texas & Pacific R.R. and is in a sugar-, rice-, and cotton-growing country. The industries include cotton mills, sugar works, tobacco factories, and machine shops. The place was settled in 1760 and incorporated in 1806. Population, 1930, 3,788; in 1950, 4,150.

Donatello (*dōn-ā-tēl'lo*), full name DONATO DI NICCOLÒ DI BETTO BARDI, sculptor, born in Florence, Italy, in 1386(?); died there in 1466. He was one of the initiators of the Renaissance in Florence, where he spent most of his life except for periods in Rome and Padua. He expressed the new spirit in the form and the execution of his single figures and in his scenes (e.g., the fountain in Padua). Among his best-known marble sculptures are "St. George," the "Zuccone," and the "Annunciation." Others include the expressive terra-cotta bust "Niccolò da Uzzano" and the bronze "David" and the "Gattamelata," in Padua, the first equestrian statue to be erected since Roman times.



TERRACOTTA BUST BY DONATELLO

Donati (*dō-nā'tē*), GIOVANNI BATTISTA, astronomer, born in Pisa, Italy, Dec. 16, 1826; died in Florence, Sept. 20, 1873. He was long connected with the Royal Inst. at Florence and discovered Donati's comet in June 1858. It is the most brilliant comet, next to the one of 1811, discovered in the last century. On Oct. 10, 1858, it was near the earth. See *Comet*.

Donation of Constantine (*dō-nā'shūn*), in history, the transfer of the ownership of the city of Rome and surrounding territory to the Pope by the Roman Emperor Constantine (272-337). The document which was once believed to prove this historical fact was eventually unveiled as an early medieval falsification.

Donelson (*dōn'el-sūn*), FORT, an important fortification of the Confederates, on the Cumberland River, in northwest Tennessee. Grant moved his forces to the Cumberland and attacked Ft. Donelson after he had captured Ft. Henry on the Tennessee, Feb. 6, 1862. The Confederates at first drove the Federal gunboats off, but Gen. Grant's prompt action made it necessary for the fort to surrender. In a memorable letter Gen. Grant demanded the surrender to be unconditional. About 15,000 Confederates were made prisoners and the fall of Nashville and Columbus became inevitable. Gen. Wheeler made an attempt to recapture the place from the Federals on Feb. 6, 1863, with a force of 4,500 of Bragg's army. The garrison of the fort was held by 600 Federals. and by successful skirmishes the attack was delayed until a gunboat came up the river, causing the attackers to withdraw.

Donetz Basin (*dō-nētz'*), the drainage basin of the Donetz (or Donets) River, located in southern Soviet Russia, noted for its industrial development. It was overrun during the German invasion in World War II and its production facilities were largely destroyed, but in 1943 Soviet forces re-entered the region and Russian engineers began to restore the plants.

Don Giovanni (*dōn jō-vān'nē*), opera by Wolfgang Amadeus Mozart (1756-91), composed, like his "*Le Nozze di Figaro*" ("The Marriage of Figaro"), to a libretto by Lorenzo da Ponte; first performed in Prague, Bohemia, in 1787. Its first American performance took place in 1826, when the famous Manuel Garcia the Elder (1755-1832) sang the leading role in the Park Theater, New York.

Dongola (*dōn'gō-lā*), a province of the Egyptian Sudan, in the eastern part of Nubia, on both sides of the Nile. The surface is level and fertile. Wheat, dates, and cattle are the leading exports. The inhabitants consist chiefly of a mixture of Nubians and Arabs. Mohammedanism is the chief religion. The province was settled by Mamelukes in 1812, after they had been expelled from Egypt, but in 1821 it was retaken by the Egyptians under Ibrahim Pasha. In 1886 a force of British and Egyptians under Kitchener quelled a rebellion, and since then the country has enjoyed an era of peace. Dongola, or El-Ordeh, the capital, is situated on the west bank of the Nile.

Doniphan (*dōn'i-fan*), ALEXANDER WILLIAM, soldier, born in Mason County, Kentucky, July 9, 1808; died Aug. 8, 1887. He was graduated

from Augusta Coll., Kentucky, in 1826, was admitted to the bar, and began a successful practice at Lexington, Mo. In 1846 he entered the U.S. service against Mexico and was with Gen. Kearny in the expedition to Santa Fe, as colonel of the first regiment of Missouri mounted volunteers. The following year he marched against Chihuahua, where he was met by a superior force of Mexicans, but compelled that city to surrender. He was three times elected to the Missouri legislature, in 1836, in 1840, and in 1854, and was a member of the peace convention in Washington, which convened to avert the Civil War.

Donizetti (*dō-nē-dzē'ttē*), GAETANO, Italian composer, born in Bergamo, Italy, Sept. 25, 1797; died there Apr. 8, 1848. He learned the elements of music in the lyceum of his native town, and studied advanced music under several masters. At the age of 20 he entered the army. While garrisoned at Venice, he produced several excellent operas, and after his discharge from military service he devoted himself to opera writing. His reputation was made by several productions that were very well received at Naples and Paris. Among other distinctions, he received appointments at the courts of Vienna and Naples, but persistent work affected his mind. Among his masterpieces are "The Martyrs," "Daughter of the Regiment," "La Favorita," and "Linda di Chamounix."

Don Juan (*dōn jū'an*), a legendary figure, first alluded to in the legends and writings of Spain, but later often mentioned in most European countries. It is represented that he was descended from a historic family resident at Seville in the time of Peter the Cruel. The life he led was one of cruelty, dissipation, and lawlessness. In an attempt to abduct Giralda, the daughter of the governor of Seville, he was intercepted by her father, but subsequently killed him in a duel. Some time after the father's interment Don Juan visited the burial place and challenged his victim's statue to follow him to a feast, which challenge was promptly accepted. After appearing at the feast and meeting the guests, the animated statue carried Don Juan to the lower regions. In some dramas the plot is laid for his rescue, which finally succeeds and he is induced to spend his life doing severe penance in a monastery. The various stories form the groundwork of many popular dramas, novels, and poems, both in Spanish-speaking countries and in many others. Mozart's "Don Giovanni" and Byron's "Don Juan" are the most celebrated works based on Don Juan.

Donkey (*dōn'kē*). See *Ass*.

Donkey. Popular symbol of the Democratic party, as originated by the well-known cartoonist, Thomas Nast, and first published on Nov. 7, 1847.

Donne (*dūn*), JOHN, metaphysical poet, born in London, 1573; died in 1631. An ironmonger's son, he studied law, and left the Roman Catholic for the Anglican Church in his early 20's. After service under Essex at Cadiz (1596), he became secretary to Sir Thomas Edgerton, but was dismissed four years later because of a secret marriage to Sir Thomas' niece. His first published work, "Pseudo-Martyr" (1610), urged Catholics to take the oath of allegiance to the king. At James I's suggestion, he took orders and was ordained in 1615. Donne delivered outstanding sermons, and later was dean of St. Paul's Cathedral (1621-31). Distinguished as the first of the 17th-century metaphysical poets, he wrote religious poems, elegies, epistles, and epigrams. Donne's collected poems appeared posthumously (1633); his life, written by Izaak Walton, prefaced a volume of his sermons (1640).

Donnelly (*dōn'nē-lī*), IGNATIUS, author and politician, born in Philadelphia, Pa., Nov. 3, 1831; died in Minneapolis, Minn., Jan. 1, 1901. Educated in Pennsylvania, he moved to Minnesota in 1857 and soon joined the Republican party. He served in Congress (1863-69) and at the end of the century was connected with the Populist party. Among his books is "Atlantis: The Antediluvian World" (1882); in "The Great Cryptogram" (1888), he tried to prove that the Shakespearean plays were written by Francis Bacon.

Donovan (*dōn'ō-van*), WILLIAM JOSEPH, lawyer and soldier, born in Buffalo, N.Y., Jan. 1, 1883; died in Washington, D.C., Feb. 8, 1959. He was educated at Columbia Univ. and started to practice law in Buffalo in 1907. Serving in World War I, he became colonel of the 165th Infantry ("the Fighting 69th") and received the Congressional Medal of Honor. After the war he continued his law career, frequently holding official positions and maintaining close contact with the Republican party of New York State. He gained an international reputation in World War II as director of the Office of Strategic Services, an espionage and sabotage group operating behind enemy lines that gained distinction for daring and effectiveness. He later served the government in other capacities (e.g., as ambassador to Thailand, 1953-54).

Don Quixote (*dōn kwik'sōt*). See *Cervantes*.
"Don't fire till you see the whites of their eyes," popular paraphrase of the advice allegedly given by Col. William Prescott (*q.v.*) to his men at the Battle of Bunker Hill (*q.v.*) on June 17, 1775. Although the policy was followed, the Americans ran out of ammunition and were forced to retreat after the third wave of British regulars was thrown against them. Some historians ascribe the phrase to Gen. Israel Putnam (*q.v.*) who participated in the battle.



JAMES H. DOOLITTLE

Doolittle (*dōō'lit'l*), JAMES HAROLD, aviator and general, born in Alameda, Calif., Dec. 14, 1896. Educated at Los Angeles Junior Coll. and the Univ. of California, he enlisted in the Army Signal Corps in 1917 as a flying cadet. In 1922 he received the Distinguished Flying Cross for completing the first one-stop cross-country flight, and in 1925 he received a Sc.D. degree from the Massachusetts Inst. of Technology. The following year he was assigned to do experimental speed flights for the Army, and between then and 1932 he won five trophy awards in air races. He resigned from the Air Corps in 1930.

He was employed (1930-40) by the Shell Oil Co.; then he was recalled to active duty in the Army. In 1942 he was assigned to Army Air Force headquarters to plan the first U.S. air raid over Japan, which took place April 18, 1942. For leading that attack, Doolittle received the Congressional Medal of Honor. At the end of the war he was a lieutenant general and reverted to inactive status in 1946.

In the postwar period he has served as a special assistant to the Air Force chief of staff, and in 1956 he became chairman of the National Advisory Committee for Aeronautics.

Doomsday Book. See *Domesday Book*.

Doorn (*dōrn*), a commune and village in Utrecht province, The Netherlands, about 10 m. S.E. of the city of Utrecht. Kaiser Wilhelm II (*q.v.*), of Germany, lived here in exile from 1919 until his death in 1941 in the Huis te Doorn, now a museum. Population, 1949, of the commune, 6,313; of the village, ca. 4,000.

Doppler's Principle (*dōp'lēr's prīn'si-pāl*), a law of physics discovered by Christian Johann Doppler (1803-53), of Austria, which states that when a body emitting light or sound waves is moving toward an observer, or the observer

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toward the body, there is an increase in the observed frequency of the waves, while there is a decrease in frequency if the motion is away from the radiating body. Thus, a stationary observer finds that the pitch of a locomotive whistle is higher when it approaches him than when it leaves. Doppler's principle is of great value in astronomy, where it permits the determination of stellar motions through measurements of shifts in the frequencies of spectral lines emitted by the stars.

Dora d'Istria (*dō'rā dēs'trē-ā*), pseudonym of HELENE GHICA, PRINCESS KOLTZOFF MASSALSKY, novelist, born in Bucharest, Rumania, Feb. 3, 1828; died in Florence, Italy, Nov. 17, 1888. After completing her education she devoted herself to a study of modern and ancient languages and literature. Her books attracted attention in a number of countries and include *"La Vie monastique dans l'église orientale"* (1855, Monastic Life in the Eastern Church) and *"Des Femmes par une femme"* (2 vols., 1864, About Women by a Woman).

Dorcas (*dōr'kas*), or TABITHA, a figure in the New Testament (Acts 9:36-43), raised from the dead by St. Peter. Since she was charitable and made garments for the poor, her name has been given to organizations engaging in such work.

Dorchester (*dōr'chēs-tēr*), a municipal borough and the county town of Dorsetshire, England. It is situated on the Frome River about 6 m. N. of Weymouth and 135 m. S.W. of London. It is the site of several old churches and a grammar school, now in modern buildings, founded in 1569. Located nearby, at Maumbury Rings, are the remains of a Roman amphitheater. It is primarily a market town. Population, 1951, 11,623.

Dordogne (*dōr-dō-nē'*), a river of southwestern France. It rises in the Auvergne Mts. in the department of Puy-de-Dôme, and flows first to the southwest and then west through the departments of Corrèze, Lot, Dordogne, and finally into the department of Gironde. At Libourne it is joined by the Isle River, and then it joins the Garonne (*q.v.*) near Bordeaux. The Dordogne is ca. 300 m. long and is navigable to about Libourne by steamship.

Dordrecht (*dōr'drēkt*), or DORT, a city in The Netherlands, in the province of South Holland, 12 m. S.E. of Rotterdam, located on an island in the Maas River. It is a port city, cut by many canals, and a transportation center. A remarkable Gothic church (built in the 14th century), an art museum, and an old city gate are among the chief landmarks. The industries include shipyards and the manufacture of machinery, instruments, and chemicals. The city was founded in 1018 by Count Dirk III of Holland and became a town around 1200. It was a wealthy commer-

cial center during the Middle Ages and a member of the Hanseatic League (*q.v.*). It was the seat of the Synod of Dort (1618-19), by which the doctrines of Calvin were affirmed. Population, 1951 (est.), 71,808.

Doré (*dô-ră*'), PAUL GUSTAVE, artist, born in Strasbourg, France, Jan. 6, 1832; died in Paris, Jan. 23, 1883. Although Doré's ambition was to become a great painter, none of his paintings achieved any notable reputation. His principal fame he won as an illustrator. His drawings and wood engravings were reproduced by wood engravers for a wide 19th-century clientele. Doré himself educated a whole group of engravers who thus identified themselves with their master's ideas.



SPANISH THEATER GROUP BY GUSTAVE DORÉ

Settling in Paris at the age of 13, Doré began to illustrate at 15. After contributing sketches to magazines and periodicals, he turned to book illustration. His first important works in this field were pen drawings for Rabelais' (*q.v.*) "*Gargantua and Pantagruel*" (1854); these were followed by a whole series of great illustration groups, the most popular of which were those for Eugène Sue's "*The Wandering Jew*," Dante's "*Inferno*," Cervantes' "*Don Quixote*," Goethe's "*Reineke Fuchs*," La Fontaine's "*Fables*," and the so-called "*Doré Bible*." Doré's illustrations demonstrate his greatest gift, the ability to adapt his style to the tone and literary style of each of the authors whose texts he illustrated.

Doremus (*dô-rê-mûs*), SARAH PLATT, philanthropist, born in New York City, Aug. 3, 1802; died Jan. 29, 1877. In 1821 she married Thomas C. Doremus, a wealthy merchant, by whose help she was enabled to give financial support to many worthy projects. Among the many enterprises which received assistance from her were

the mission for French-Canadian peasants, the House and School of Industry for Poor Women in New York, and the Nursery and Child's Hospital. During the Civil War she helped the sick and wounded of both the North and South. After the war she founded the Presbyterian Home for Aged Women, extended aid during the famine in Ireland in 1869, and founded several associations, including the Female Bible Society.

Doria (*dô-rê-ă*), a famous family of Genoa, whose history dates back to the 12th century. ANDREA DORIA, admiral and statesman (born in Oneglia, Italy, Nov. 30, 1468; died in Genoa, Nov. 25, 1560), was its most distinguished member. Before becoming commander of the Genoese fleet, he was a soldier of fortune, serving in the papal guard and under a number of Italian princes. He was a fleet commander of King Francis I, of France, but because of disagreements he joined the forces of Emperor Charles V in 1528, under whom he expelled the French from Genoa. He thereupon established a republican regime in Genoa, whose independence he carefully guarded, although he placed the city-state under the domination of the emperor. He remained in the emperor's service until 1544, helping to achieve, during these years, several victories against the Turks (*e.g.*, the conquest of Tunis in 1535). After his return to Genoa, he had to contest a popular uprising against his rule in 1547, which for a time forced him to leave the city. A modern Italian passenger liner named in his honor sank in the Atlantic (45 m. s. of Nantucket Island, Mass.) on July 26, 1956, after a collision with the Swedish steamship *Stockholm*, causing the loss of 53 lives.

Dorians (*dô-ri-anz*), one of the two principal branches of the Greeks, the other being the Ionians. According to legend, the Dorians descended from Dorus, a son of Hellen, and made settlements in the Peloponnesus. Among the cities of importance founded by them were Argos, Sparta, and Messenia. Their colonies included Sicily, Crete, and settlements in Asia Minor. The dialect of the Dorians was harsh and rough, while the Ionian was mild and polished, yet some admirable features of the former caused it to be used widely in hymns and choruses. The Dorian architecture is distinguished by strong and unadorned pillars, while the Ionian pillars are slender and profusely decorated. See *Column*.

Doric Order (*dô-ric ôr-dêr*), the earliest and strongest of three Grecian orders of architecture. It is noted for the fact that its proportions are the same as those of a man; that is, the height of a man is about six times the length of his foot and in the Doric style the height of the column is six times the diameter. The order is remarkable for simplicity and harmony. Many Dorian temples, such as those of Mars, Minerva, and Her-

cules, are famous for their long, unbroken lines. Simplicity marks the Doric capital; the frieze and cornice are massive but plain. See *Column*.

Dormant (*dôr'mant*). See *Hibernation*.

Dormouse (*dôr'mows*), a squirrellike rodent commonly found in Europe, having soft fur, black eyes, a bushy tail, and short forelimbs. Like the squirrel, it sits on its hind legs. It also stores food for its winter hibernation. It feeds on nuts and seeds and lives in bushes and trees where it makes nests for its young. The young, from two to four in number, are produced twice a year. They are born blind but are soon able to take care of themselves. The common dormouse of Europe is the smallest of the species. It is less than 6 in. long, including the tail, and is yellowish-red in color. One European species, gray with black markings, is edible.

Dorpat (*dôr'pät*). See *Tartu*.

Dorr (*dôr*), THOMAS WILSON, politician and reformer, born in Providence, R.I., Nov. 5, 1805; died Dec. 27, 1854. After graduation (1823) from Harvard Univ., he studied law and practiced at Providence. In 1840 he began a campaign for such state reforms as the extension of suffrage. This campaign resulted in the People's Constitution, drafted by an unauthorized convention in Providence in October 1841. The People's Constitution was ratified by popular vote, and Dorr was chosen governor by his followers on April 18, 1842. The state legislature in its own convention (February 1842) had adopted the Freeman's Constitution, and it chose Samuel W. King as governor. Both governors claimed authority. When the state supreme court and President Tyler refused to recognize Dorr's constitution or his government, he organized (1842) Dorr's Rebellion. The uprising was easily repulsed, and he fled the state, returning (1843) when a third constitution, embodying liberal voting reforms, was approved. He was convicted (1844) of high treason and sentenced to life imprisonment. High public feeling against the harsh sentence led to his release in 1845, and his rights and privileges were restored in 1851.

Dorsetshire (*dôr'sët-shîr*), a maritime county in southern England, on the English Channel. An agricultural region of rolling hills and fertile valleys, it is crossed by chalk ranges running east and west and has a rocky coast with a good harbor at Poole. The chief occupations are sheep raising and dairy farming; there are Portland and Purbeck marble quarries. The area has a number of interesting pre-Roman antiquities, particularly Maiden Castle, a large earthwork estimated to have been built ca. 2000 B.C. Thomas Hardy (*q.v.*) was born here and wrote of the region in his "Wessex" novels. The county seat is Dorchester (*q.v.*). Population, 1951, 291,323.

Dort (*dôrt*), SYNOD OF, an assembly of the Dutch Reformed Church held in Dort, Holland,

1618-19, to decide the theological differences between the Arminians (Remonstrants) and the Calvinists. The Remonstrants, a more liberal and less dogmatic offshoot of the Dutch Reformed Church, were condemned by the synod, and their leaders were persecuted and exiled. After the death (1625) of Prince Maurice, who had led the move to suppress the divergent group, the ban was lifted; in 1795 the Remonstrants were recognized as an independent church.

Dortmund (*dôrt'möont*), a city in the former province of Westphalia, Germany, on the Dortmund-Ems canal, ca. 20 m. E. of Essen. It is a rail and industrial hub of the Ruhr (*q.v.*), and its industries include coal and iron-ore mining, steel plants, coke works, breweries, and petroleum refineries. After it became a free town in 1220, Dortmund joined the Hanseatic League, but it lost its rights in 1803 and was annexed to Nassau. When Westphalia was ceded by the Netherlands in 1815, the town went to Prussia. It was severely bombed in World War II. Population, 1959 (est.), 600,000.

Dos Passos (*dôs pás'ôs*), JOHN RODERIGO, writer, born in Chicago, Ill., Jan. 14, 1896. He was graduated from Harvard Univ. in 1916. His work includes "Three Soldiers" (1921), "Manhattan Transfer" (1925), the well-known trilogy "U.S.A." (1938)—comprising "The 42nd Parallel" (1930), "1919" (1931), and "The Big Money" (1936)—"Most Likely to Succeed" (1954), "Men Who Made the Nation" (1957), and "Great Days" (1958).

A member of that group of writers which ap-

JOHN DOS PASSOS

Photo by S. Schell, courtesy Houghton Mifflin Co., N. Y.





FEODOR M. DOSTOYEVSKI

peared after the First World War, and which has been called "the lost generation," Dos Passos is known for his microscopic analyses of the American scene, for his penetrating studies of social forces, and especially for his stylistic innovations.

Dostoyevski (*dó-stá-yěf'skê*), FEODOR MIKHAILOVICH, one of the greatest Russian writers, born in Moscow, Russia, Oct. 30, 1821; died Feb. 12, 1881. The son of a physician, he was educated at the military engineering academy of St. Petersburg (Leningrad), but soon turned to literature, studying with great interest the classic writers of Russia, Gogol and Pushkin, as well as the French writers, Balzac and George Sand. His first story, "Poor People," which appeared in 1846 (first translated into English in 1894), soon stirred the public, and was followed by others, among them "White Nights." His connection with the circle around the political agitator, Petrachevski, caused his arrest in 1849 and he was sentenced to four years of forced labor in Siberia and military service for life. His Siberian experiences made a strong impression on Dostoyevski's whole life and resulted in his documentary reports, published as "Recollections of a Dead-House" (1858). After his release from these four terrible years in which he was "like a man buried alive," Dostoyevski became a common soldier in a Siberian regiment. In 1858, however, after the death of Nicholas I, he was given the rank of an officer, and was allowed to leave Siberia in 1859. He started immediately on a very active literary career, working with his brother on a periodical, and publishing his novel, "The Insulted and Injured." His great work, "Crime and Punishment," which was to become a classic of world literature,

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appeared in 1866. All the bitter experience that Dostoyevski had gained from his four years of life among outcasts, his great understanding of human nature and its dark and subconscious elements, combine to make this work one of the greatest of psychological human documents. Among Dostoyevski's other works, "The Idiot" (1868) and "The Brothers Karamazov" (1881) deserve special mention.

At the time of his death, Dostoyevski was a venerated figure and was nationally mourned. However, his fame spread to England only after the translation of "Crime and Punishment" into English (1885). The art and style of Dostoyevski are characterized by his great insight into the human soul and into the pathological aspects of the mind. The quality of this insight has been admired by physicians and jurists alike. A great sympathy and a deep understanding characterize his approach toward men; he struggles with the concept of God and His power, and with the idea of His irrational being which reveals itself only to the modest and kind.

Dothan (*dó'thān*), a city in southeastern Alabama, seat of Houston County, 109 m. s.e. of Montgomery, served by the Atlantic Coast Line and other railroads and a municipal airport. Its industries include textile mills, aircraft plants, lumbering, metal works, food and tobacco processing, and manufacture of chemicals and furniture. In 1958 the value added by manufacture was \$17,764,000. Dothan was settled in 1885. Population, 1950, 21,584; 1960, 31,440.

Douay (*dōō-ā'*), or DOUAI, the name by which the version of the Bible used by English-speaking Catholics is known. The translation was made by divines connected with the Coll. of Douay, France, under the direction of Cardinal Allen, the founder of that institution. It is based on the Vulgate and is authoritative among Catholics, having received the sanction of the Pope and the approval of the Council of Trent. The Old Testament was published in 1609, about two years before the authorized edition of King James' Protestant Bible appeared. The New Testament now published with the Douay version of the Old Testament was first issued at Rheims in 1582. Both have been revised at different times.

Doubleday (*dūb'l-dā*), ABNER, general, credited with the origin of the game of baseball, born at Ballston Spa, N.Y., June 26, 1819; died in Mendham, N.J., Jan. 26, 1893. A West Point graduate (1842), he served in the Mexican War, and was made captain in the war against the Seminoles. In 1861 he was second in command at Ft. Sumter and fired the first gun in defense of the fort during its bombardment and capture by the Confederates (April 12-13). As a brigadier general he was assigned to the defense of Washington. Later he commanded on the Rappahan-

nock, at Bull Run, Chancellorsville, Fredericksburg, and Gettysburg. In 1865 he was promoted to major general in the regular army, remaining in active service until 1873. Among several books relating to the war he published "Gettysburg Made Plain," "Reminiscences of Forts Sumter and Moultrie," and "Chancellorsville and Gettysburg."

Double Stars (*dūb'l stārz*), or BINARY STARS, a term in astronomy. Many stars when examined in the telescope are found to consist of two components near together, either equal in brightness or differing more or less in intensity and sometimes in color. William Herschel (*q.v.*) was the first to establish orbital motion in such double stars; the two components revolve around their common center of gravity in elliptical orbits. The study of such double stars has shown that the law of gravitation found by Sir Isaac Newton (*q.v.*) for the solar system applies equally to the most distant stars and also makes it possible to measure stellar masses.

Doubs (*doo*), a department of France, on the Swiss frontier. It has an area of 2,052 sq. m., approximately 20 per cent of which is cultivable; the rest of the land is divided among forests and pastures, the latter devoted largely to dairy cattle. The capital is Besançon (population, *ca.* 65,000), known for manufactures of watches and clocks. Doubs is traversed by four parallel ranges, running from the northeast to the southwest, of the Jura Mts.; the highest point in the department is Mont d'Or (4,800 ft.). The DOUBS RIVER, for which the department is named, rises in the Jura Mts., flows first southwest, then northwest, for *ca.* 270 m. and discharges into the Saône River. Population, 1946, 298,255.

Douglas (*dūg'lās*), a city of Cochise County, Ariz., on the Southern Pacific R.R. The surrounding country produces copper, cement, lime, cattle, and agricultural products. Douglas has machine shops, cement works, and stockyards. The chief buildings include the high school and the city hall. Population, 1940, 8,623; in 1950, 9,442.

Douglas, a city of Great Britain, capital of the Isle of Man, on the east shore of the island, 80 m. n.w. of Liverpool. It has several slaughter houses and a large trade in merchandise. An extensive breakwater and a lighthouse afford safety for steamships. Population, *ca.* 22,000.

Douglas, the name of an ancient and celebrated family of Scotland. The first member of the family mentioned in history is William of Douglas, who is generally assigned to the period between 1175 and 1213. "The Good Sir James," who fought at Bannockburn with Robert Bruce, was a descendant of William. He not only served the cause of Scotland, but, after the death of Bruce, faithfully complied with his request to carry Bruce's heart to the Holy Land. Among the descendants are William Douglas, Earl of Liddel-

dale, and Sir William Douglas, who ranked among the celebrated warriors and contestants for the Scottish throne. Before 1357, the Douglasses had no higher title than knight, but in that year Sir William Douglas was made Earl of Douglas and by marriage became Earl of Mar. In 1371 he claimed succession to the Scottish crown in opposition to Robert II, the first of the Stuarts. His son, James, who was recognized as second Earl of Douglas and Mar, was slain in the Battle of Otterburn in 1388, and the earldom of Douglas was bestowed on Archibald, Lord of Galloway, surnamed the Grim. The title succeeded from generation to generation to various personages bearing the name of Douglas until 1646, when it passed to the third son of the first Marquis of Douglas, who was created Earl of Selkirk. After that time the Earls of Selkirk became the only representatives of the family.

Douglas, DONALD WILLS, aircraft manufacturer, born in Brooklyn, N.Y., April 6, 1892. After he was graduated (1914) from Massachusetts Inst. of Technology, he was chief engineer (1915-20) of Glenn L. Martin Co., aircraft producers, and chief civilian aeronautical engineer (1916-17) to the U.S. Signal Corps. In 1920 he organized the Douglas Co. (now Douglas Aircraft) at Santa Monica, Calif., and by the middle of the 1930's he had developed the DC-3, the transport plane that made mass air travel possible. During and after World War II, he played an important role in the nation's program of air strength.

Douglas, LLOYD CASSEL, clergyman, author, born in Columbia City, Ind., Aug. 27, 1877; died in Los Angeles, Calif., Feb. 13, 1951. Educated at Wittenberg Coll. and the Hama Divinity School, in Springfield, Ohio, he was ordained a Lutheran minister in 1903 and later held several pastorates throughout the Middle West. His novels "The Magnificent Obsession" (1929) and "Forgive Us Our Trespases" (1932) were his first efforts to present a religious theme within a narrative framework. His books became so popular that he retired from the ministry in 1933 to devote his full time to writing. His other works, almost all best sellers, include "Green Light" (1935), "Disputed Passage" (1939), "Invitation to Live" (1940), "The Robe" (1942), and "The Big Fisherman" (1948). His autobiography—"A Time to Remember" (1951)—and "The Living Faith" (a selection of sermons) were published posthumously in 1955.

Douglas, MELVYN, actor, born MELVYN HESSELBERG in Macon, Ga., April 5, 1901. After several years of acting in road shows, he appeared on Broadway in 1928 and in 1931 made his screen debut in "Tonight or Never." His rise to stardom was quite rapid and he made many movies, one of his most popular being "Ninotchka" (1939) with

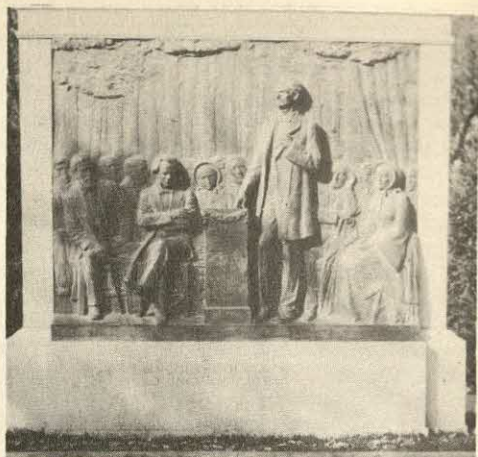
DOUGLAS

Greta Garbo (*q.v.*). Douglas served in the Army (1942-46). His later stage appearances included "Two Blind Mice" (1949), "Time Out for Ginger" (1953), and "Inherit the Wind" (1955). He also appeared on television and coproduced "Call Me Mister" in 1946. In 1931 he married HELEN GAHAGAN (born in Boonton, N.J., Nov. 25, 1900), an actress, singer, and U.S. Congresswoman. After studying at Barnard Coll. (1920-22), she acted in many Broadway productions, visited Europe on a concert tour (1928-30), and sang with the San Francisco Opera Company (1935). In 1944 she was elected Democratic Congresswoman and served California in the House of Representatives until 1950, when she ran for the Senate and was defeated by Richard M. Nixon (*q.v.*).

Douglas, PAUL HOWARD, economist, politician, born in Salem, Mass., March 26, 1892. He studied at Bowdoin Coll. (1913), Columbia Univ. (M.A., 1915; Ph.D., 1921), and Harvard Univ. (LL.D. 1915-16) and joined the faculty of the Univ. of Chicago in 1920, becoming a professor in 1925. In 1942 he enlisted in the Marine Corps and was a lieutenant colonel when he was discharged in 1945. He returned to Chicago and in 1948 was elected Senator from Illinois as a Democrat; he was later re-elected. He is a member of the liberal bloc, promoting civil-rights legislation and welfare reforms; but he is also an independent who has occasionally crossed party lines on such issues as government economy, advocating less spending. A prolific writer, many of his works are standard texts of economic theory. They include "Real Wages in the United States, 1890-1926" (1930), "The Theory of Wages" (1934), "Controlling Depressions" (1935), "Social Security in the United States" (1936), "Economy in the National Government" (1952), and "Ethics in Government" (1952).

Douglas, (WILLIAM) SHOLTO (1ST BARON DOUGLAS OF KIRTLESIDE), marshal of the R.A.F., born in Oxford, England, Dec. 23, 1893. He studied at Lincoln Coll., Oxford, and served in the Royal Flying Corps during World War I. In World War II he held important commands, including the fighter command (1940-42) and the military governorship of the British zone of occupied Germany (1946-47). He was created a baron in 1948 and later held important positions in the civil aeronautics field.

Douglas, STEPHEN ARNOLD, statesman, born in Brandon, Vt., April 23, 1813; died in Chicago, Ill., June 3, 1861. He was the son of a physician, who died when Stephen was two years old. He studied law for three years at an academy in Canandaigua, N.Y., but did not begin his practice until he moved to Jacksonville, Ill., in 1834. Success came rapidly and he became public prose-



Courtesy Chamber of Commerce, Quincy, Ill.

LINCOLN-DOUGLAS DEBATE, 1858

Relief by Lorado Taft (1860-1936)

cutor (1835), secretary of state of Illinois (1840), and judge of the state supreme court (1841). He was elected to the U.S. House of Representatives in 1843. In 1847 he was elected to the U.S. Senate where he served until his death in 1861.

Douglas, owing to his unusual aptitude and small stature, was commonly called the "Little Giant," and ranked as one of the most influential leaders of his party. In Congress he actively favored the acquisition of the whole of Oregon, and was chairman of the Committee on Territories. He supported the Compromise of 1850, promulgated the doctrine of popular sovereignty, and supported the pro-slavery Kansas-Nebraska bill. He held that the right to restrict slavery to any part of the country was not vested in Congress. Accordingly, he became a strong opponent of the Wilmot Proviso, which provided for the prohibition of slavery in any territory that might be acquired by the peace treaty with Mexico. As to slavery in the territories, he held that the settlers should decide for themselves, from which came the expression squatter sovereignty.

Douglas was a candidate for the Presidency in the Democratic conventions of 1852 and 1856. In 1858, he won the senatorship of Illinois in a close race with Abraham Lincoln. Their public debates concerning the controversial matter of permitting slavery in the territories decided the election. In 1860 he received the nomination for President by the Northern division of the Democrats, the Southern nominating John C. Breckinridge, but lost the election to Abraham Lincoln, whose loyal supporter Douglas became for the one remaining year of his life.

Douglas, WILLIAM LEWIS, capitalist and politician, born in Plymouth, Mass., Aug. 22, 1845; died Sept. 17, 1924. He attended the public schools and began work in the shoe shop of his uncle at an early age. Later he was employed in the

cotton mills at Plymouth, and in 1876 opened a small shoe shop at Brockton, Mass. From this humble beginning he built up one of the largest shoe factories in the world, with a capacity of about 20,000 pairs of shoes per day, and in addition established about 75 retail shoe stores in large cities. In 1883 he was elected to the Massachusetts house of representatives, was re-elected several times, and became mayor of Brockton in 1891. He was elected governor of Massachusetts as a Democrat in 1904, but declined to be a candidate for a second term. He was a delegate to many national conventions.

Douglas, WILLIAM ORVILLE, associate justice of the U.S. Supreme Court, born in Maine, Minn., Oct. 16, 1898. He received his A.B. from Whitman Coll., Walla Walla, Wash. (1920), and his LL.B. from Columbia Univ. (1925). He was admitted to the New York bar in 1920, served on the law faculty of Columbia Univ. (1925-28), and taught at Yale Univ. (1928-34). In 1929, President Hoover asked him to direct bankruptcy studies for the Department of Commerce. A Democrat, he was director of the Protective Committee Study of the Securities and Exchange Commission (1934-36) and commissioner and chairman of the commission (1936-39). In 1939 he was appointed to the high court, where he has shown a consistently liberal attitude. An enthusiastic traveler and mountain climber, Douglas has written many books about his adventures, including "Beyond the High Himalayas" (1952), "West of the Indus" (1958), and "My Wilderness: East to Katahdin" (1961). His books in other fields include "We the Judges" (1955) and "The Right of the People" (1958).

Douglass (*dū'glas*), FREDERICK, abolitionist and journalist, born Frederick Augustus Washington Bailey in Tuckahoe, Md., in February 1817(?); died in Washington, D.C., Feb. 20, 1895. His mother was a Negro slave and his father a white man. Escaping from slavery in 1838, he went to New Bedford, Mass., where he changed his name; his eloquence as a speaker attracted notice, and he was made an agent of the Massachusetts Anti-Slavery Society. Fearing capture as a fugitive, he went to Great Britain in 1845. When he returned to the U.S. in 1847, friends had collected sufficient money for him to purchase his freedom. He settled in Rochester, N.Y., where for 17 years he published the weekly *North Star*, a paper devoted to the abolitionist cause. During the Civil War Douglass organized regiments of Massachusetts Negroes for the Union army. He served as secretary of the commission to Santo Domingo (1871), U.S. marshal in the District of Columbia (1877-81), and minister to Haiti (1889-91). His autobiography, "Narrative of the Life of Frederick Douglass," was published in 1845 (revised edition, "The Life and Times of Frederick



Courtesy N. Y. Zoological Society

NECKLACED TURTLE DOVE

Douglass," 1941). In 1963 his home in Washington was established as a part of the capital's system of parks.

Doukhobors (*dū'kô-bôrz*), meaning "spirit fighters," the name of a Russian religious sect, founded in the early part of the 18th century. Members of the sect fought for and with the spirit of God which they saw represented in every man's soul. They refused to recognize any temporal authority, holding that all men are equal and children of God. They were persecuted by the Czarist authorities in the 19th century, but were permitted to settle in a community in southern Russia. Later, because of their opposition to military conscription, they were deported to Georgia in the Caucasus. In 1899, large numbers emigrated to Canada, and others settled in Mexico.

Doumer (*dōō-mă'*), PAUL, President of France, born at Aurillac, Cantal, France, March 22, 1857; died May 7, 1932. In 1888 he entered parliament as deputy for the Aisne and was finance minister in the Bourgeois cabinet (1895-96). He did not occupy a prominent position during World War I, but as finance minister in the Briand cabinet (1921-22) he piloted the reparations proposals through the Paris conference. In 1931 he was elected President of France, but was assassinated in 1932.

Doum Palm (*dōōm pām*). See *Palms*.

Douro (*dō'rōō*), a large river of the Iberian Peninsula, rising in the northern part of Spain, and flowing west through a portion of Spain and the whole of Portugal. The entire course is 500 m. and the most important tributary is the Pisuega. Because of rocks and sand banks, only about 70 m. are navigable. The mouth of the river, where it flows into the Atlantic Ocean, is 3 m. below Oporto, Portugal.

Dove (*dūv*), a variant name for the smaller

birds of the pigeon (*q.v.*) family. The most common variety is that known as the mourning dove in North America and the turtle dove in Europe. The dove is used to symbolize peace and gentleness and in Christianity, to represent the Holy Spirit (Matthew 3:16).

Dover (*dō'vēr*), a city, capital of Delaware and seat of Kent County, in the central part of the state, on the St. Jones River, 40 m. s. of Wilmington. Served by the Pennsylvania R.R., it is a marketing and shipping center for farm produce; industries include food-processing and the manufacture of rubber products. It is the site of Dover Air Force Base. Dover was laid out in 1717, made state capital in 1777, and became a city in 1929. Population, 1950, 6,223; in 1960, 7,250.

Dover, a city in southeastern New Hampshire, seat of Strafford County, on the Cochecho River, 11 m. n.w. of Portsmouth, served by the Boston & Maine R.R. Its industries include boat-building, die-making, electroplating, metal- and wood-working, and the manufacture of electronic components, motors, printing presses, sales registers, shoes and leather, and fiber and rubber products. In 1958 Dover had a value added by manufacture of \$20,694,000. It was settled ca. 1622 and incorporated in 1855. Population, 1950, 15,874; in 1960, 19,131.

Dover, a town in northern New Jersey, situated on the old Morris Canal, 8 m. n.w. of Morristown. It is served by the Central of New Jersey and the Delaware, Lackawanna & Western R.R.'s. Industries include iron and steel works, machine shops, textile mills, and the manufacture of stoves. In 1958 Dover had a value added by manufacture of \$32,622,300. It was settled in 1722 and chartered in 1875. Population, 1950, 11,174; in 1960, 13,034.

Dover, a city in eastern Ohio, in Tuscarawas County, on the Tuscarawas River, 75 m. s. of Cleveland, on the Baltimore & Ohio and the Pennsylvania R.R.'s. Atwood and Dover dams and reservoirs are nearby. Dover is in an area producing coal and fireclay. It manufactures steel, chemicals, electrical appliances, and wood products. Its value added by manufacture in 1958 was \$15,666,000. Dover was founded in 1807 and became a city in 1903. Population, 1950, 9,852; in 1960, 11,300.

Dover, an important seaport of England, on the Strait of Dover, about 70 m. s.e. of London. Only 21 m. from the French coast, it is the nearest to France of the English seaports. Many railroad lines connect it with the interior. Noteworthy buildings are the churches of St. James and St. Mary, Dover Coll., and the town hall. The Castle of Dover, located on the chalk cliffs east of the city, was built by the Romans. Manufacturing establishments include paper mills, flour mills, and iron foundries. It has an excellent har-

bor; the Admiralty Pier protects its entrance. The city and surrounding districts are rich in relics of ancient times. Population, 1947 (est.), 41,000.

Dover, STRAIT OF, the sea channel which separates England from France, and connects the English Channel with the North Sea. The length is 24 m. It is 25 fathoms deep at the time of the spring tides. The narrowest point is at Dover, where it is 21 m. wide. Numerous chalk cliffs on both sides of the strait indicate that at remote ages Great Britain was connected with the mainland.

Dow (*dou*), or DOU, GERARD, painter, born at Leyden, Holland, in 1613; died there in 1675. He received his early instruction from Dolando, a draftsman, and subsequently studied under Rembrandt. His works excel in delicacy and harmony of coloring and are considered gems of art. About 200 paintings extant are attributed to him. Some of them have been sold at very high prices and are in the leading collections of Europe. Among the most noted are "The Village Grocer," "The Dentist," "The Interior of a Household," "The Charlatan," "The Fiddler," and "The Dropsical Woman."

Dow, NEAL, temperance reformer, born in Portland, Me., March 20, 1804; died there Oct. 2, 1897. After being educated at Friends' Acad., New Bedford, Mass., he located in his native town, where he was elected mayor in 1851 and was re-elected five years later. Through his efforts, the Maine prohibitive liquor law was passed in 1851. He served as a member of the state legislature in 1858-59 and accompanied Gen. Butler to New Orleans as colonel of the 13th Maine volunteers, rendering efficient service in the Civil War. He was taken prisoner in 1863 and was exchanged the following year, after which he resigned. Dow is best known for his persistent work as a temperance lecturer and reformer. In 1880 the Prohibition party nominated him for President of the U.S.; he received 10,305 votes.

Dowden (*dou'den*), EDWARD, scholar and critic, born in Cork, Ireland, May 3, 1843; died Apr. 4, 1913. He studied at Trinity Coll., Dublin, and became professor of oratory in the same institution, but was soon transferred to the chair of English literature. In 1900 he was made secretary of the council of Trinity Coll. The Cunningham Gold Medal of the Royal Irish Acad. was awarded to him. His writings are numerous, including a history of French literature and critical works on Shelley and Wordsworth. Among his books are "Studies in Literature," "Romeo and Juliet," "The Shakespeare Primer," "The Pilgrim," and "Southey's Correspondence With Caroline Bowles."

Dowie (*dow'ē*), JOHN ALEXANDER, founder of the city of Zion. See *Christian Catholic Church*.

Downes (*downz*), (EDWIN) OLIN, music critic, born in Evanston, Ill., Jan. 27, 1886; died in New York City, Aug. 22, 1955. He began to study music at the age of eight and received training in piano, music history and analysis, harmony, and other essentials of music from masters throughout the country. In 1906 he began his career as critic with the *Boston Post*, leaving the *Post* in 1924 to join the staff of the *New York Times*, where he remained until his death. One of America's foremost music critics, he was also a writer, lecturer, and radio commentator. His books include "Be Your Own Music Critic" (1914), "The Lure of Music" (1918), "Symphonic Broadcasts" (1931—republished in 1935 as "Symphonic Masterpieces"), and two volumes of songs which he edited, "Songs of Russia" and "A Treasury of American Songs."

Downing (*doun'ing*), ANDREW JACKSON, architect and landscape architect, born in Newburgh, N.Y., Oct. 31, 1815; died near Yonkers, N.Y., July 28, 1852. In his early years he helped his brother Charles operate a nursery in Newburgh, and ca. 1838 he became sole owner. His "Treatise on the Theory and Practice of Landscape Gardening, Adapted to North America" (1841) established his reputation as an authority on landscape gardening, as did his "Cottage Residences" (1842). In 1845 he published "Fruit and Fruit Trees of America," written with his brother, and in 1850 "Architecture for Country Houses." He was editor of the *Horticulturist* from 1846 until his death. He designed many country residences, especially along the Hudson River, and in 1851 was commissioned to plan the grounds for the Capitol, White House, and Smithsonian Institution in Washington, D.C. On his way to the capital to supervise the work, the Hudson River steamer on which he was sailing burned and he was drowned.

Downing Street (*doun'ing*), a street in London, England, on which are located the foreign and colonial offices of the British government and, at No. 10, the prime minister's residence. In popular usage the term Downing Street refers to the British government generally.

Downpatrick (*dounpāt'rik*), a town and urban district in County Down, Northern Ireland, 21 m. s.e. of Belfast. It is a market town for the oats, flax, sheep, and other farm produce of the district and has linen mills, but its chief importance is as a religious center. St. Patrick, who is believed to have founded a church there ca. 440, is buried in the town; and the remains of a monastery, said to have been founded by him, are near by. Downpatrick was the residence of the ancient kings of Ulster. Population (urban district), 1951, 3,877.

Dowson (*dou'sūn*), ERNEST CHRISTOPHER, poet,

born in Lee, England, Aug. 2, 1867; died in London, Feb. 23, 1900. After graduating from Oxford in 1888 he led a Bohemian life and was a member of the Rhymer's Club, a group of decadent poets of the late nineteenth century. He is chiefly remembered for his lyrics, especially "Cynara," though he also wrote a play "The Pierrot of the Minute" (1897) and several prose works. His "Poems and Prose" was published posthumously in 1919.

Doxology (*dōks-ōl'ō-jy*), a sacred hymn of praise to God. Among the best-known doxologies are *Gloria in Excelsis*, *Gloria Patri*, and "Praise God from whom all blessings flow." See also *Hymnology*.

Doyle (*doil*), SIR ARTHUR CONAN, author, born in Edinburgh, Scotland, May 22, 1859; died in Crowborough, England, July 7, 1930. He studied medicine at the Edinburgh Royal Infirmary and took a degree there in 1881 but abandoned medicine in 1890 to devote his time to writing. He is best known for the creation of the fictional character *Sherlock Holmes* and his friend *Dr. Watson*. The first *Sherlock Holmes* story, "A Study in Scarlet" appeared in 1887. It was followed by "The Sign of the Four" (1890), "The Memoirs of Sherlock Holmes" (1905), "His Last Bow," (1917); and "The Case Book of Sherlock Holmes" (1927). He also wrote several historical novels, including "Micah Clarke" (1889) and "The White Company" (1891). He was knighted in 1900 for his services to England, especially the writing of "The Great Boer War." In his later years he became a spiritualist, writing "The History of Spiritualism" (1926). His "Memories and Adventures" was published in 1924.

Drachma (*drāk'mā*), or DRACHM, the name of a silver coin and of a measure of weight in ancient Greece. The measure of weight was composed of six *oboli*, or a handful. A *mina* contained 100 drachmas and a *talent* contained 1,000. As a unit of weight it was approximately equal to an apothecary's dram. The silver drachma is still used in Greece. See *Coins*.

Draco (*drā'kō*), a lawgiver of Greece, one of the most eminent of Athens, who was appointed (621 B.C.) to codify the laws of Athens, which heretofore had never been written down and had been administered arbitrarily. Draco's code of laws provided the death penalty for almost all offenses and hence were rarely enforced. His laws were later modified, and some abolished, by Solon (*q.v.*). It is said that Draco died from suffocation while at Aegina when a cloak was thrown about him by the populace as a mark of respect.

Draft (*drāft*), or CONSCRIPTION, a system of inducing men into the armed forces for military service. The modern system is based upon that of ancient Rome, where conscription was resorted

to as a means to recruit the army. In most countries of Europe military service is obligatory for every able-bodied man. In the U.S. drafting was resorted to as early as the days of the American Revolution (1775-83), when the Continental Congress passed (1777) a resolution that exempted persons be compelled to supply a certain number of substitutes for the armed forces. The Civil War (1861-65) proved conclusively that volunteers alone could not sustain a great military undertaking; the Enrollment Act (March 1863) set active-service quotas for each state of the Union. Under this law it was possible to supply a substitute acceptable to the Army or to purchase one for \$300 (see also *Draft Riots*). Under the draft bill of World War I, 2,800,000 men entered the services. Under the Selective Training and Service Act of 1940, the first peacetime compulsory service act in U.S. history, 900,000 men were called to serve for a year in the armed forces. Of about 15,000,000 persons who served in the armed forces between 1940 and the end of 1945, around 10,000,000 were inducted by Selective Service. By June 1945, the U.S. forces reached the record-setting strength of 12,314,000. In 1948 a bill to draft men between the ages of 19 and 25, to serve for 21 months, was passed and extended in 1950 and 1951, when the age limits were changed to 18½ to 26 years. In 1955 the act again was extended to July 1, 1959. Under an act covering universal military training (*q.v.*), passed in 1951 and later amended, draftees are required to serve a period of 24 months, with a maximum eight-year (six-year for those inducted after Aug. 9, 1955) obligation for combined active duty and subsequent reserve obligation.

See also *Air Force*; *Army*; *Marine Corps*; *Navy*.

Draft Riots, disturbances in the U.S., especially in New York City, which occurred as the result of the passage of a conscription act (March 3, 1863) for the Union army during the Civil War. Resentment against the act, which provided that a conscripted man could supply a substitute or buy one for \$300, led to four days of bloody rioting (July 13-16) in New York City. Largely affecting Negro quarters, the violence resulted in the death of ca. 1,000 persons. Police and militia, aided by troops rushed back from the front, quelled the riots, and the following year legislation was passed which allowed only conscientious objectors the privilege of buying a substitute for the army.

Dragon (*drāg'ūn*), any one of several species of small, brightly colored lizards found in the East Indies and southern Asia. The dragon is sometimes called the flying dragon because five or six of its ribs are extended on each side and covered with weblike skin to form a pair of

pseudo-wings which enable it to make long, gliding leaps from tree to tree.

In mythology the name dragon is applied to a



DRAGON

Chinese porcelain plate, early 18th cent.

creature, half beast, half serpent, with a lion's claws, eagle's wings, serpent's tail, and fiery breath. The mythical dragon is found in many cultures and epochs, including the Babylonian, ancient Roman, and Chinese empire. In folk tales such as the *Nibelungenlied*, *Beowulf*, and the story of St. George, the dragon is a ferocious enemy who is slain by a hero.

Dragonfly (*drāg'ūn-flī*), the name of a large number of insects found in many parts of the world, especially in South America and Japan. The dragonfly has two pairs of wings which lie flat against its back when it is at rest, and it is capable of swift flight. It feeds on insects, especially gnats, flies, and mosquitoes. It lays its eggs in water, where the larvae remain for a year. Because of its somewhat ferocious appearance, with large, broad head, prominent, closely set eyes, and long body, it has been called horse stinger and devil's darning needle, but it is quite harmless and can neither bite nor sting.

Dragon Tree, a tree belonging to the lily family and native to the Canary Islands. The stem is usually short in proportion to its thickness, and the short branches are topped by tufts of sword-shaped leaves. Its small, greenish flowers grow in clusters and its berries are orange-colored. The bark yields a reddish resin called dragon's blood which is used for coloring varnishes.

Draining (*drān'ing*), a term applied extensively in agriculture to the process of drawing off superfluous water by artificial means. Through the agency of draining, large tracts of otherwise wet and waste lands have been rendered capable

of cultivation. The common way in extensive areas is to excavate a great open channel or ditch, through which the water passes off freely after rains or the melting of snow or ice. Lands to be used for cultivation are usually drained by the construction of tile drains. The common drain tile is manufactured of clay, is circular in form, commonly 12 in. long, and has an inside diameter measuring from 3 to 15 in. The larger sizes, which range from 18 to 40 in. in diameter, are generally made 2 ft. long, either of clay or concrete. In order to construct a proper tile drain it is necessary to make a careful survey of the district to be drained, forming an estimate of the approximate amount of water to be carried from the region, and locate the tile so that a proper fall will insure the unobstructed passage of the water. A complete system of drainage requires a number of minor drains or laterals, which carry the water to the main drain. The number of such laterals depends upon the character of the surface and the nature of the soil, since a hard clay soil is not so easily penetrated by moisture as are loose and sandy formations.

In the colder countries the tile drain should be deep enough to lie below the frost line in the winter, or water freezing within will burst the tile and impair the drain. The best drains are at least 4 ft. deep at the shallowest places; this necessitates placing them at great depths through moles or hills. It has been found that the system of draining lands, though quite expensive in some cases, is ultimately profitable, owing to the fact that the lands redeemed are usually the richest and most fruitful. Tile factories are operated in practically all of the states where drainage is necessary and the proper clays are found. By the use of this method the amount of arable land has been greatly increased. There are other forms of drainage, such as open ditches made by plows, layers of stones covered by earth, and perforated drain pipe of circular sections covered by stones and earth, but the most common is the one employing tiles made of clay or concrete.

Drake (*drāk*), SIR FRANCIS, navigator, born near Tavistock, Devonshire, England, between 1539 and 1545; died in the West Indies, Jan. 28, 1596. He was the son of a Protestant yeoman who received a navy chaplain's post from Queen Elizabeth. Francis was apprenticed to a coasting vessel and by the time he was 18 had risen to the rank of purser. When his master died, he fell heir to the ship and conducted a successful trade. Becoming captain of the *Judith* in 1567, he seized a chance to serve under his cousin, Sir John Hawkins, during an engagement in the Gulf of Mexico. He obtained a privateering commission from Queen Elizabeth in 1570, and two years later embarked on a cruise to the West Indies, where he enriched himself by capturing and

plundering the Spanish settlements. At this time he crossed the Isthmus of Panama, and saw the Pacific Ocean for the first time. His fame and wealth won him much attention in England, and, following his presentation to Queen Elizabeth, he was enabled to undertake his famous voyage through the Straits of Magellan. Near the end of 1577 he set out with five small ships, manned by 166 sailors, entering the Straits on Aug. 21, 1578. Emerging into the Pacific Ocean, he sailed north along the coast of Chile and Peru, plundering every likely port. He spent some time in the vicinity of San Francisco Bay, where he became very popular with the natives, and finally set out for the Dutch East Indies. Homeward bound through the Indian Ocean, he doubled the Cape of Good Hope and reached Plymouth laden with treasure in 1579. Queen Elizabeth sanctioned his piracy even though the Spaniards were crying out for his punishment. On his return, she boarded his ship, the *Golden Hind*, where she shared in a banquet and honored him with knighthood. Drake's voyage around the world was the first to be achieved by an Englishman. The *Golden Hind*, the only ship to survive the entire voyage, was preserved for many years and its timber was finally used to make a chair later presented to Oxford Univ. Drake became mayor of Plymouth in 1581. He was twice married, in 1583 and 1585.

After the outbreak of hostilities with Spain, Drake embarked on further conquests in the Spanish Main (1586). At about this time he visited the new colony in Virginia and is sometimes credited with introducing the potato and the tobacco plant to England. When the great Spanish Armada was under construction in 1587,

SIR FRANCIS DRAKE

Courtesy Bettmann Archive, N. Y.





Courtesy Brown Bros., N. Y.

KNIGHTING OF FRANCIS DRAKE BY QUEEN ELIZABETH

Drake set out with a fleet of 30 ships, entered the port of Cadiz, and set fire to 100 enemy vessels. This action may have postponed the action of the Spaniards for a year. Drake was appointed vice admiral under Lord Howard and conducted a brilliant offensive to crush the Spanish Armada which sailed into the Channel in 1588. Among other things, he captured a large galleon commanded by Pedro de Valdez, thought to be the Spanish leader. The Armada was ruined and Spanish naval supremacy broken. Drake's next expedition was directed against the Spaniards in Portugal, but this action was not very successful. More disastrous was his last expedition to the West Indies with Hawkins. Drake died of an attack of dysentery and was buried at sea near Porto Bello.

A brilliant and adventurous spirit, Drake was one of the founders of England's great naval supremacy. He consistently supported an offensive method in naval warfare and believed that victory was dependent on a combination of nobility, seamanship, and gunnery.

Drake, FRIEDRICH JOHANN HEINRICH, sculptor, born at Pyrmont, Germany, June 23, 1805; died Apr. 6, 1882. He was the son of a turner and served in the shop of his father as an apprentice, but at an early age began to show an inclination to study art. In 1827 he began to study sculpturing under Rauch and later studied under Thorwaldsen in Italy. Among his early works is a

group entitled "The Dying Warrior," completed in 1833. His "Madonna and Child," made about the same time, was purchased by the Empress of Russia. The marble statue of Frederick William III, in the Berlin Tiergarten, is one of his best productions.

Drake, JOSEPH RODMAN, poet, born in New York City Aug. 7, 1795; died Sept. 21, 1820. His parents died while he was a boy, and his early livelihood depended upon his own resources. He engaged in business for some time and later studied medicine. In 1812 he became associated with Fitz-Greene Halleck and was a friend of James Fenimore Cooper. His longest poem is "The Culprit Fay," written when he was 22, and his best-known poem is "The American Flag," the four concluding lines of which were written by Halleck. He was for some time a writer for the *New York Evening Post* and contributed many witty poems to that periodical. He died at an early age from tuberculosis.

Drakensberg (drä'kens-bûrg) or QUATH-LAMBA, an elevated mountain range in the Union of South Africa, extending for about 600 m. along the eastern part of Cape Province and the borders of Natal and the Orange Free State. The highest peak, Mont aux Sources, where the Tugela River rises, is 10,761 ft. Champagne Castle (or Cathkin Peak) is almost as high, with an altitude of 10,500 ft. The mountains are steep on the sea side but gradually slope

inland to the South African plateau. Two passes, Van Reenan and Laing's Nek, are crossed by railroad. During the Boer (or South African) War, the mountain area was the scene of many battles.

Drake University, a coeducational institution at Des Moines, Iowa, the largest independently endowed institution of higher learning in Iowa. The university was founded in 1881. The chief benefactor was Gen. Francis Marion Drake, after whom the university was named. He made an initial gift of \$20,000 to establish the school and several other contributions, bringing the total to about \$250,000. George Thomas Carpenter was the first president and held this office until 1894.

The chief buildings include Old Main, the Auditorium, University Christian Church, Howard Hall, Cole Hall, Memorial Hall, Carnegie Hall, Cowles Library, and the Drake Stadium, home of the Drake Relays. Since 1949, ten new buildings have been added, including Oreon E. Scott Meditation Chapel, the Harvey Ingham Hall of Science, and the Fitch Hall of Pharmacy.

Drake has nine colleges: business administration, divinity, education, fine arts, law, liberal arts, pharmacy, the Graduate Coll., and the Community Coll. The library contains 160,000

volumes. Student enrollment in daytime classes is about 3,200. In addition to the day-college enrollment, Drake's Community Coll. enrolls about 3,000 students annually in courses given in the late afternoon and evening. The Community Coll. also takes courses to students in 30 centers throughout the state of Iowa each semester. There are more than 200 members of the Drake faculty. The physical plant is valued at more than \$8,000,000.

Drama (*dra'mā*), from the Greek *dran* meaning to act, in the most general sense a stage play written for interpretation by actors. In this sense it encompasses a wide field, from the gay but insignificant vaudeville (*q.v.*) to tragedy, as in Shakespeare's "Hamlet," Goethe's "Faust," or Shaw's "St. Joan." In the conception of modern literature, however, drama implies only literary tragedy or literary comedy (see *Comedy*; *Tragedy*) and those plays which are based on meaningful dialogue. Independently of whether written in verse or prose, the drama in its current concept must have a definite significance and a workable idea, whether comic or tragic, the idea to be conveyed by a succession of situations involving characters portrayed by actors, the whole developing into a recognizable plot. All other categories of stage presentations, such as burlesque, vaudeville, ballet, pantomime, or even

ORESTES AND IPHIGENIA—SCENE FROM AN ATTIC TRAGEDY

Greek vase painting, ca. 400 B.C.



opera, are, in the modern conception, not drama.

The origin of the drama has been widely investigated and discussed. While in the eastern civilizations the drama has its earliest roots in magic, in western civilization its origin can be traced from the religious dance of ancient Greece of the 8th and 7th centuries B.C. It is the Greek drama upon which the whole development of this branch of literature is based, despite the fact that the mystery plays of the Middle Ages, Shakespeare's dramas, and modern comedies of manners may seem unrelated to it. Even the most condensed survey of the Greek drama will show that the essential elements of drama as we now conceive it were contained therein: the use of words in connection with gesture; the idea of struggle between individuals or groups; clarification of the story by a succession of situations.

The development of Greek drama stems from the *Dithyrambos* (8th and 7th centuries B.C.) which was a dance performed around an altar and accompanied by songs, honoring the god Dionysus whose life and deeds were thus glorified. The next step was the introduction of an individual engaging in dialogue with the chorus, a development which probably originated in Attica, Greece, in the 6th century B.C. The content of this "play" gradually became enlarged, Demeter and other Greek deities also being honored, very often in connection with specific religious cults. Thespis, supposed to have lived in the mid-6th century B.C., became the symbol of a more highly developed stage, with costumes and masks coming into use. Most of the playwrights of this period, such as Epigenes and Phrynichos, are largely legendary.

At first the performances took place in the open air within a circle near the temples of the deities being honored. Gradually, however, grandstands and open stages were developed, the latter first of circular, later of semicircular, design, with a small hut for the actors (*skene*) in the background.

The three great classical masters, Aeschylus (525-456 B.C.), Sophocles (496-405 B.C.), and Euripides (480-406 B.C.) were the initiators, not only of the actual drama, but also of the definite architectural form of the Greek theater. It is a miraculous fact that the works of the first dramatist, Aeschylus, show elements of a genuine dramatic plot and of dramatic psychology. Thought and poetic presentation are equally present in near perfection, as if Aeschylus marked not the beginning (as in actuality he did) but the end of a long literary development. Sophocles, younger friend and competitor of Aeschylus, utilized a more complicated technique. The struggle with fate is with Sophocles no longer the main content of the drama, the characterization of single persons becoming a theme in itself. Compared with these two dramatists, Euripides mir-

rored in his tragedies psychological and individual conflict almost modern.

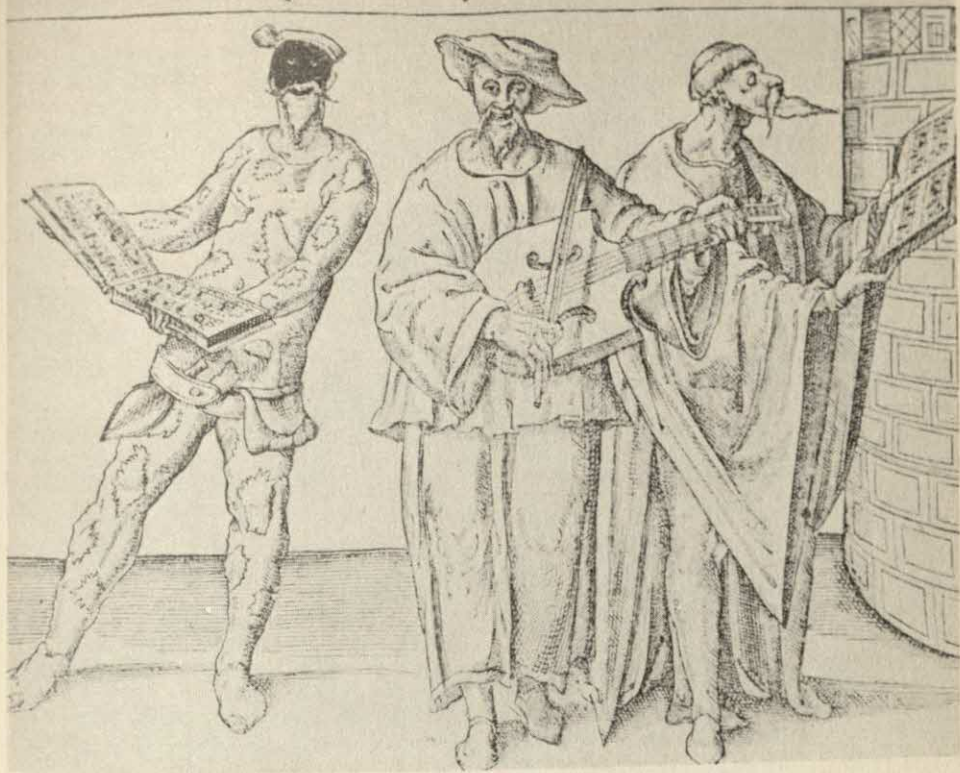
These three great poets devoted their work to tragedy. Aristophanes (446-385 B.C.) became the first great representative of comedy, using irony, caricature, and allegorical animals to support his inventions. It was he who directly influenced the Roman writers of comedy—Plautus (ca. 254-184 B.C.) and Terence (190-159 B.C.)—in their work. Before Plautus and Terence, Roman civilization had not known genuine drama, but rather loosely presented scenic sequences. Tragedy never found an artistic representation in Rome, the principal interest of the people being chariot races, gladiatorial contests, pantomimes, and the like.

With the decline of the Roman Empire, the drama, bitterly opposed by the Christian church, gradually faded out, not to be revived until about 1200 A.D. with the development of the so-called mystery and miracle plays and of the passion plays, all of which had their roots in the mysteries of the Bible or in the lives of the saints. (A forerunner of these performances was a slight dramatic presentation sometimes given within churches as early as the 11th and 12th centuries.) The drama was not, however, considered a product of literature, as in Greek and Roman civilization, nor principally as entertainment. It served exclusively religious purposes. It was but a single century after its revival, however, before the people, instinctively seeking and welcoming entertainment, changed this conception. In addition to the main content, mystery plays began to develop elements of what we today call "horse-play" and burlesque, sometimes even in contradiction to the religious character of the work. Performances were given on one or many stages simultaneously, before the church or in an open market place. Throughout medieval times only members of the various craft guilds and not professional actors took part. Many of these mystery plays have been preserved, e.g., the Lucerne Easter play and the Donaueschingen play. The Passion play traditionally presented at Oberammergau may be said to have developed from similar preserved manuscripts. The form and style of these plays, known to us through lists of props, stage designs, and direction books which have been preserved, were almost identical everywhere in Europe. In England, however, presentation took place on pageant wagons drawn through the town. In this way scenes followed each other in succession instead of being presented simultaneously as on the market place stages. The so-called Chester cycle, the York cycle, and the Wakefield cycle are among the most famous of English mystery plays. The play of the Lord's Supper, presented in York throughout the 14th century, had a performance as late as 1582, almost encroaching on the Shakespearean age.

Harlequin.

Zany Corneto.

Il Segnor Pantalon.

SCENE FROM THE *COMMEDIA DELL' ARTE*

Engraving from Beijer's "Fragments of the First Italian Comedies"

Modern drama may be said to date from the Italian Renaissance. Stimulated by rediscovered ancient dramas, particularly those of Terence and Plautus (revived in Italy about the mid-15th century), Italian poets began to create works in their native tongue in contrast to the classical Latin of the revivals. "Orfeo" (1471) by Angelo Poliziano (1454-94) and "Il Timone" (1494) by Matteo Boiardo (1434-94) are typical examples. One of the best-known tragedies of this period was "Sofonisba" by Giovanni Trissino (1478-1550), written in 1515, but not performed until 1562, 12 years after the author's death. From about this time on, drama became a principal topic of interest for the educated world, a development climaxed in Italy in Torquato Tasso (1544-95), with his "Aminta" (1573), a work which set the style for many Shakespearean plays. However, even in this flourishing period of Italian drama, it was the lighter *commedia dell' arte* (*q.v.*) which most appealed to the people.

Drama as we conceive it today reached its zenith in the works of William Shakespeare (1564-1616), probably the greatest dramatic genius of all time. But Shakespeare's was not a sudden advent on the Elizabethan stage; he re-

flects the ultimate of an era. The English court had for some time been under the cultural influence of Italy. "Ralph Roister Doister" (*ca.* 1553) by Nicholas Udall (1505-56), probably the first English comedy, works by George Gascoigne (*ca.* 1535-77), and Christopher Marlowe (1564-93) all had their Italian or Latin models, though an individual English style was beginning to take shape. In this tradition Shakespeare produced his immortal comedies and tragedies, many of them with plots strongly suggestive of earlier Italian works. Only Ben Jonson (1573-1637) and the writing team of Beaumont (1584-1616) and Fletcher (1579-1625) could rival Shakespeare in his own day.

For half a century following the brilliant Elizabethan period, the Puritan revolution abolished the theater as an art form entirely.

Meanwhile, in Europe the drama was beginning to assume individual nationalist tendencies. In Spain, the development climaxed in the works of Lope de Vega (1562-1635), a contemporary of Shakespeare, and De Vega's successor, Pedro Calderón (1600-81). The classic age of the theater in France had one of its greatest standard bearers in Pierre Corneille (1606-84), author of

was primarily interested in the development of individual characters as they are shaped by conflict and tragic experience, while Schiller, the most theatrical of the three great German dramatic poets, gave to the stage its proper heritage: a story of historic interest represented in private lives or in the heroic deed of an individual.

1906) and Björnsterne Björnson (1832-1910) were creating an entirely new and realistic form of the drama, which was caught up and carried forward by the Swedish August Strindberg (1849-1912). Although not actually the originator of the modern social drama, Ibsen may be said, by reason of his unwavering championship, to have inured the



"LE MALADE IMAGINAIRE" BY MOLIÈRE

French 18th-century performance

Heinrich von Kleist (1772-1811), forerunner of the romantic school, may well be said to rank with the above.

The most important theatrical writers of 18th-century Italy, Carlo Goldoni (1707-93), and Carlo Gozzi (1720-1806), cannot be termed dramatists in the narrower sense of the word. Their writings were true comedies with none of the compensating metaphysics of Molière's works.

Although the 19th century brought an abundance of dramatic production, its importance has faded rapidly. The works of the French playwrights, Alexandre Dumas *fils* (1824-95), with his "La Dame aux Camélias"; Victor Hugo (1802-85), with his "Marion Delorme," and Victorien Sardou (1831-1908) with his "Madame Sans-Gêne" are viewed today as nothing more than sophisticated entertainment with little true dramatic value. Only Edmond Rostand (1864-1918), with his masterpiece, "Cyrano de Bergerac," and his contemporary, Paul Claudel (1868-1955), can be evaluated as genuine dramatists.

In the second half of the 19th century, the dramatic accent shifted from France to the North. Here the Norwegian writers Henrik Ibsen (1828-

public to it. Another important foundation of modern dramatic development is to be found in Russia. Alexander Pushkin (1799-1837) and Nikolai Gogol (1809-52) paved the way for the greater dramatists, Leo Tolstoy (1828-1910) and Anton Chekhov (1860-1904), actual creators of what we today call the modern theater. Compared with them, Maxim Gorki (1868-1936) was not equally forceful, but his "The Lower Depths" must be counted among the fundamental plays of the school of naturalism. The same generation, represented in Russia by Leonid Andreyev (1870-1919), began to turn toward symbolism led by the Belgian Maurice Maeterlinck (1862-1949).

The 19th century in England was more lyrical than dramatic. John Keats (1796-1821), George Gordon, Lord Byron (1788-1824), Alfred, Lord Tennyson (1809-92), and Robert Browning (1812-89) all wrote dramas, but the poetry of this era eclipsed the drama in importance. Not until the close of the century did Oscar Wilde (1856-1900) emerge, proving in his "Salome" that he could write a stage work of force and power as well as his charming comedies of manners. Sir James M. Barrie (1860-1937), a writer of fantasy, and

DRAMA

Arthur Wing Pinero (1855-1934), expert of the fashionable drama, were among those effecting a revival of the drama in "Gay Nineties" England. John Drinkwater (1882-1937), John Galsworthy (1867-1933), and their contemporary, John Masefield (1878-) developed their talents more impressively in poetry and the novel than on the stage. It is to the Irish George Bernard Shaw (1856-1950) that we must turn to encounter an English-writing dramatist who can compare in importance to his contemporary Scandinavian and Russian colleagues. With the single exception of William Butler Yeats (1865-1939), a fellow Irishman and a mystic and lyric poet, Shaw stands alone and foremost among English playwrights of his time.

Before approaching the creative work of our generation, we must return to Germany of the 19th century. Almost all the poets of this time attempted drama, but only Christian Friedrich Hebbel (1813-63), Otto Ludwig (1813-65), and the Austrian Franz Grillparzer (1791-1872) can be counted successful. Modern naturalism, inspired by the Scandinavian writers, was developed in the works of Germany's greatest contemporary man of letters, Gerhart Hauptmann (1862-1946) and in the more superficial writings of Herman Sudermann (1857-1928). Among Austrian writers of this period Arthur Schnitzler (1862-1931), Hermann Bahr (1863-1934), Carl Schönherr (1868-1943), and especially the poet Hugo von Hofmannsthal (1874-1929) deserve mention.

In the 20th century, the Americans became the



Courtesy Wide World Photos, N. Y.

"UNCLE VANYA" BY ANTON CHEKHOV

Margaret Leighton and Laurence Olivier of the Old Vic Company

leading dramatists in the English language. Early American drama was crude and largely patterned after the English. After a somewhat reluctant start, with such playwrights as Percy MacKaye (1875-1956) and Edward Sheldon (1866-1946), the theatrical Eugene O'Neill (1888-1953) appeared

"MADAME SANS-GÈNE" BY VICTORIEN SARDOU AND ÉMILE MOREAU





A SCENE FROM "KRAPP'S LAST TAPE"

Donald Davis starred in this work by Samuel Beckett, whose plays have recently received considerable critical notice and wide acclaim

to create a new and forcefully expressive form of drama. Today, only Thornton Wilder (1897-) can be compared with him in dramatic intensity and originality. Less "literary" than O'Neill and Wilder, but nevertheless prominent among U.S. writers for the stage are Elmer Rice (1892-), Robert E. Sherwood (1896-1955), Maxwell Anderson (1888-1959), Lillian Hellman (1905-), and Clifford Odets (1906-). Balancing on the small edge between drama and mere entertainment are Marc Connelly (1890-), Moss Hart (1904-), Samuel N. Behrman (1893-), Paul Green (1894-), Sidney Kingsley (1906-), Sidney Howard (1891-1939), George Kelly (1887-), and George S. Kaufman (1889-1961). William Saroyan (1908-), William Inge (1913-), Tennessee Williams (1914-), and Arthur Miller (1916-) are younger playwrights of talent. William Somerset Maugham (1874-), J. B. Priestly (1894-), and Noel Coward (1899-), native English writers though closely identified with the American stage, have more of dramatic value in their work than is generally realized. A renaissance of English poetic drama, which suffered a general decline in the first half of the 20th century, seems indicated by several successful plays, including "The Cocktail Party," by T. S. Eliot (1888-), and "The Lady's Not for Burning," by Christopher Fry (1907-).

The 20th century in Europe has seen little in the way of important drama, Edmond Rostand (1868-1918) and Maurice Maeterlinck (1862-1949) being representatives of the 19th-century period of naturalism and symbolism. However, Franz Werfel (1890-1945) and Ferenc Molnár (1878-1952) and the philosopher-playwright Jean-Paul Sartre (1905-) are noteworthy.

There have been a few in Germany and Italy, however, who have trod paths beyond the natu-

ralistic and symbolic. The Italians, Gabriele d'Annunzio (1863-1938) and, in quite another way, Luigi Pirandello (1867-1936), have strongly influenced the present generation. Contemporaries of Maeterlinck and Hauptmann, they differ from the Belgian and German in being neither symbolic nor naturalistic, but have developed an entirely new conception of characterization. In Germany, the contemporaries Carl Sternheim (1881-1943), Frank Wedekind (1864-1918), and Georg Kaiser (1878-1945) show trends made familiar to us through Eugene O'Neill but in a far more involved way. Ernst Toller (1893-1939), Bertolt Brecht (1898-1956), Ernst Barlach (1870-1938), and Carl Zuckmayer (1896-) reflect influences of the previous generation.

The development of motion pictures and the general trend toward superficial light entertainment have diminished the creative power of dramatic production in all countries. However, there are still dramatists whose works will surely survive the initial success of a single theatrical season. The impact of the great Russian, Scandinavian, and German dramatists of the preceding generation and of George Bernard Shaw is inherent in all their writings.

Draper (*dra'pēr*), ANDREW SLOAN, educator, born in Westford, N.Y., June 21, 1848; died in Albany, N.Y., April 27, 1913. After attending Union Coll., he practiced law in Albany. He became superintendent of public instruction in New York State, president of the Univ. of Illinois, and then commissioner of education for New York State (1904-13). His works include "The Powers and Obligations of Teachers" (1887) and "The Authority of the State in Education" (1890).

Draper, HENRY, scientist, son of John William Draper (*q.v.*), born in Prince Edward County, Va., March 7, 1837; died in New York City, Nov.

20, 1882. He was educated at the Univ. of the City of New York, in which he became professor of natural science in 1860, and later was named professor of physiology and dean of the medical faculty. He became interested in astronomy and built himself an observatory, where he did valuable research work in stellar spectroscopy. Congress appointed him head of a U.S. expedition to observe the transit of Venus in 1874. He announced the discovery by photography of oxygen in the sun in 1877.

Draper, JOHN CHRISTOPHER, physician, son of John Wm. Draper (*q.v.*), born in Prince Edward County, Va., March 31, 1835; died in New York City, Dec. 20, 1885. He was graduated from the Univ. of New York, where he was later professor of physiology (1858-60). He was subsequently professor of natural science in the Coll. of the City of New York, and professor of chemistry in the medical department of New York Univ. Besides contributing to scientific journals, he wrote books on chemistry and medicine.

Draper, JOHN WILLIAM, chemist, born near Liverpool, England, May 5, 1811; died at Hastings-on-Hudson, N.Y., Jan. 4, 1882. He studied chemistry at the Univ. of London, emigrated to the U.S. in 1832, and pursued advanced studies in the medical department of the Univ. of Pennsylvania. In 1837 he became professor of chemistry at the Univ. of New York, and in 1850 was chosen president of the medical school of that university, a position he held for 23 years. He is noted for his researches in photochemistry and spectrum analysis. He found a way to obtain accurate photographic representations of the moon's surface, and successfully photographed the diffraction spectrum. He published several textbooks in the fields of history, natural sciences, and physiology.

Draper, RUTH, monologist, born in New York City, Dec. 2, 1884; died there, Dec. 30, 1956. Privately educated, she first appeared professionally in 1911. A success in London (1920) led to appearances in the U.S. at various times and in South Africa (1935), Australia and India (1938), South America (1940), and Canada (1940-41). A skilled actress, she wrote her own sketches—37 of them, including 58 characters—and translated (1933) the Italian poetic drama "Icaro," by Lauro de Bosis.

Drave (*drä'və*), an important river of Europe, rising in the eastern part of the Tyrol. Its course is through Carinthia in Austria, and Croatia in Yugoslavia. It joins the Danube 14 m. e. of Osijek. The entire length is 450 m., about 350 m. of that distance being navigable for small craft. The valley it traverses is populous and noted for its fertility. Maribor, Lienz, and Osijek are among the cities on its banks.

Dravidians (*drä-vīd'i-ānz*), the name applied

to a group of Indian peoples and their languages, in the southern part of India. They include the people who speak several tongues, including the Kanarese, Malayālam, Tamil, Telugu, and a number of others. The Dravidian languages show no affinity with any other linguistic family, except that these tongues have been modified through contact with Indo-European forms of speech. About 12 or 14 dialects are spoken. The Tamil and Telugu are literary languages and, in colloquial form, are spoken by about one-half of the Dravidian peoples.

Drawbench (*drā'bēnch*), a machine in which strips or rods of metal, especially wire, are drawn by pulling them through successively smaller openings in hard plates, or through dies.

Drawing (*drā'ing*), the art of delineating the forms of objects on a flat surface by means of lines drawn with a pen, crayon, pencil, or some similar object. It is frequently taught as a branch of study in schools and colleges, and is employed in making charts and maps. Architects employ drawing in preparing plans and views of buildings, machinery, and figures. In *geometrical* and *mechanical* drawing instruments are used to guide the hand, while *freehand* drawing is done from objects without an artificial guide, as the name indicates. Mechanical drawing includes *topographical* drawing, *ship draughting*, and *architectural* drawing. Another class of drawing, the *perspective*, aims to represent the aspect of an object from a given point of view as it appears to the eye. This branch of instruction is an aid in determining relative proportions and forms. Paintings in water colors and sketches for oil paintings are frequently called drawings. See *Painting*.

Dray (*drā*). See *Wagon*.

Drayton (*drā'tūn*), WILLIAM HENRY, statesman, born at Drayton Hall, on the Ashley River in South Carolina, in September 1742; died at Philadelphia, Sept. 3, 1779. He studied at Westminster School and Balliol Coll., Oxford, England, and returned to South Carolina in 1764. He was admitted to the bar and wrote extensively on political topics, espousing the revolutionary cause. As presiding officer of the Provincial Congress in 1775, he advocated aggressive measures leading to war. The following year he was elected chief justice of South Carolina. Later he served as a delegate to the Continental Congress (1778-79). His manuscript "History of the Revolution" formed the basis for the memoirs written in 1821 by his son, John Drayton (1766-1822).

Dreams (*drēmz*), ideas or images of a sleeping person, in which he seems to see things real and substantial. Dreams are accounted for by some writers as resulting from uninterrupted trains of ideas passing through the mind at all times at night as well as by day, and as being

modified and influenced largely by the thoughts of the objects in which the mind is engaged during the period of wakefulness.

In dreams the train of ideas appears as a series of events passing before the eye, or as objects affecting the senses. The periods in which dreams pass before the eye may cover a brief period or extend over several years, though the actual time elapsing may be but a few minutes.

Drebbel (*drēb'el*), CORNELIUS VAN, inventor, born in Alkmaar, Holland, 1572; died in 1634. Of peasant birth, he numbered among his patrons the Emperors Rudolph II, Ferdinand II, and King James I of England, where he lived from about 1620. There he introduced the microscope, telescope, and thermometer, though sometimes credited with inventing them. For his compound microscope and a machine designed to produce perpetual motion, he was accused of sorcery. He discovered a way to dye wool scarlet by using cochineal and tin. His wool and silk dyeing processes were later employed in Gobelin making.

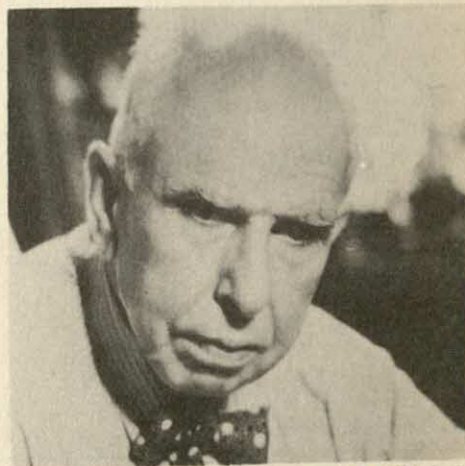
Dredging (*drēf'ing*), the act of excavating sand, earth, or rocks, particularly under water. The type of machinery used is frequently designed for the specific task. In general, dredges consist of a floating barge bearing machinery to operate a series of buckets on a continuous chain; or to operate a grapple which closes around rocks. Hydraulic dredges, equipped with suction tubes, are used to remove sand, mud, or earth from the bottom of rivers, harbors, etc. The process of securing oysters, plants, and shells from the bottom of the water is usually called dredging. The common dredge for catching oysters consists of a scraper attached to an iron frame. A bag fastened to the frame at the rear of the scraper receives the oysters, from which they are taken after being landed on the shore or on boats. Naturalists employ an apparatus for securing specimens of marine forms for examination, which is constructed similar to that of an oyster dredge.

Dred Scott (*drēd sōt*) **Decision**, a decision of the U.S. Supreme Court delivered by Chief Justice Taney on Mar. 6, 1856, regarding a slave named Dred Scott. This slave was in the possession of an owner in Missouri. He was taken to Illinois and then to Minnesota, which was at that time a Territory. Illinois and Minnesota were then free soil, and on this Dred Scott was kept a number of years, after which he was taken back to Missouri. After the death of Dr. Emerson, the claimant of the slave, Dred Scott with his family claimed to be free, on the ground that they had been taken to free territory and could not be held in slavery after returning to Missouri. In the decision it was stated that Scott had no right to sue for liberty, because no colored person was regarded by the Constitution as a citizen and that a slave, or his descendants, had no legal rights.

The decision attracted much attention, because it degraded the slave to the level of a machine. In addition Chief Justice Roger B. Taney (*q.v.*) attacked the Missouri Compromise (*q.v.*), under which the free territories had been formed.

Dreibund (*drī'bōnt*), the compact formed between Germany, Austria (1879), and Italy for mutual defense and friendship; long considered a safeguard in the balance of power in the continent of Europe. Italy withdrew from the Dreibund in 1915.

Dreiser (*drīs'ēr*), THEODORE, author who early introduced realism into American literature, born in Terre Haute, Ind., Aug. 27, 1871; died Holly-



Courtesy Brown Bros., N. Y.

THEODORE DREISER

wood, Cal., Dec. 28, 1945. Educated at Indiana Univ., he reported for Chicago and St. Louis newspapers (1891-94), then edited *Smith's Magazine* (1905-06), *Broadway Magazine* (1906-07), was editor-in-chief of all Butterick publications (1907-10), and edited the *American Spectator* (1927-34). His well-known books include: "Sister Carrie" (1900), "Jennie Gerhardt" (1911), "The Financier" (1912), "The Titan" (1914), "The Genius" (1915), and "An American Tragedy" (1925). He wrote: "Plays of the Natural and Supernatural" (1916), and a tragedy, "The Hand of the Potter" (1919); poetry, as "Moods" (1926); and after a trip to the U.S.S.R., "Dreiser Looks at Russia" (1928). Later works were: "Dawn" (1931), "Tragic America" (1932), "America Is Worth Saving" (1941), "The Bulwark" (1946), and "The Stoic" (1947).

Dreiser has contributed largely to the development of fictional realism, despite the clumsiness of his style: disregarding conventional taboos, he was the first American novelist to undertake such an objective chemical analysis of the human animal as Zola had achieved in France.

Dresden (*drēs'dēn*), a city of Germany, capital of the state of Saxony, situated in the valley of the Elbe River. A number of boulevards lead up to and surround the city, while extensive orchards and vineyards abound in the vicinity. Portions of the city are on both sides of the Elbe. The population is largely Lutheran in religion and supports numerous fine churches, many of which have important connection with historical and international events. Many of the government buildings are beautiful. The state library contains 450,000 volumes, including many rare and valuable specimens of ancient writings and numerous manuscripts. Dresden is particularly famous for its gallery of pictures, which is counted among the most valuable in the world.

Among Dresden's chief manufactures are pianos, porcelain, jewelry, glass, chinaware, clothing, fabrics, and machinery. Commerce is facilitated by extensive railroad connections and navigation on the river. Among the public parks and gardens are the Zoological Garden and the Groszer-Garten.

Dresden is mentioned in history in 1206, and has long been a city of importance, both from a commercial and educational standpoint. The sovereigns made it their residence since 1485. It was almost entirely destroyed by fire in 1491, but subsequently it was extended and improved by Augustus the Strong. The enlargements and valuable improvements made by Augustus I and II in the first half of the 18th century gave the city a

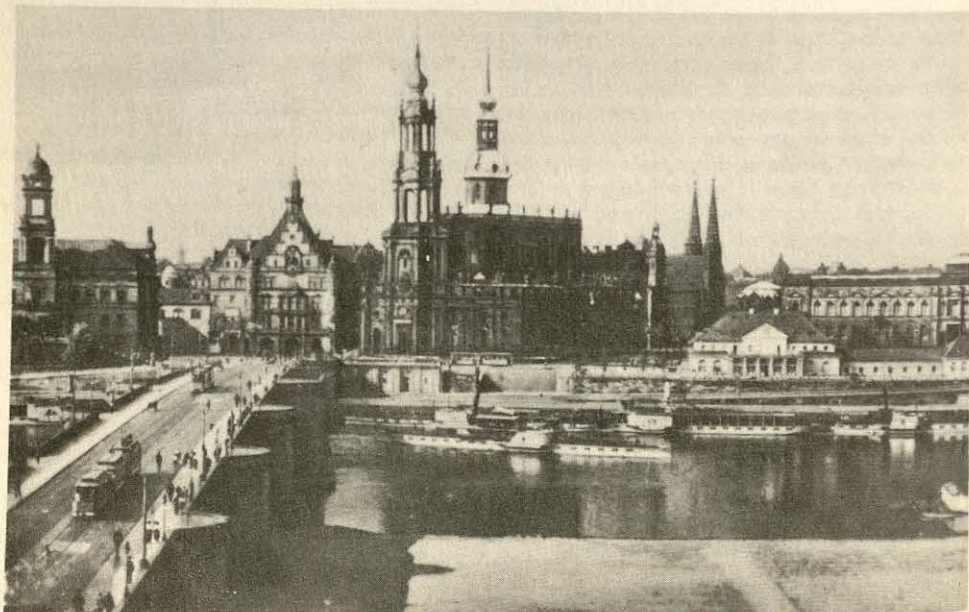
basis for rapid growth during the last century. During the Seven Years' War, the Napoleonic wars, and the revolution of 1849 it suffered severe losses. In March 1945, the German radio announced that Dresden "had been completely wiped from the map" as a result of Allied air attacks. It was later occupied by Russian troops. Population, *ca.* 600,000.

Dresden, BATTLE OF, a battle at Dresden, Germany, on Aug. 27, 1813. The French army of 30,000 men occupied Dresden and the allied army of Austrians, Prussians, and Russians, commanded by Schwarzenberg, appeared before it on Aug. 23. Napoleon came with the main army to relieve it on the 26th and a great pitched battle was fought the following day, in which the allies were defeated. The French lost about 7,500 men in killed and wounded, but the allies lost the same number and 20,000 of their men were taken prisoners.

Dress (*drēs*), in general, body covering or costume worn as a protection against heat or cold, as well as for conventional and esthetic reasons; specifically, the frock or outer garment worn by women. Fashion in dress varies throughout the world because of widely different climatic conditions, living standards, customs and traditions, occupations and artistic conceptions. From primitive tribe to civilized nation, accepted standards in dress range all the way from complete nudity and partial nudity through various stages to complete (except for face and hands) covering of the

DRESDEN, BEFORE WORLD WAR II

Courtesy Brown Bros., N. Y.



body. In a majority of cases, a distinct difference has existed between male and female attire. Today, differences among national dress are being lessened by advances in transportation and communication, enabling greater exchange of ideas and goods.

and Rome was simple, the garments were well adapted to the climate and conditions of life, and the wealthy adorned them with fine embroidery and ornamentations. The *tunic*, a kind of chiton, was used extensively in Rome, over which an outer garment, the *toga*, was worn;



CAVALCADE OF DRESS

1, Assyrian; 2, Greek; 3, Roman; 4, German, 14th cent.; 5, Spanish, 16th cent.; 6, English, 16th cent.

The history of dress dates back to man's beginnings, but the earliest information is based upon traditions and rude sculptures. We have reasonably authentic accounts of the garments worn by the Babylonians, Assyrians, and Egyptians, the mummies of the latter giving concrete evidence. Mention of raiment for the body is made in many places of the Old Testament, such as the vestments worn by the early priests, but the first account we have is of the rude covering of the body made with leaves by Adam and Eve. Frequent mention is made of the raiment of needlework, of purple and fine linen, and of the sackcloth of sorrow and repentance. The mantles worn by the Hebrews were four-cornered and were bordered with fringes and ribbons of blue. The Assyrians were advanced in the arts of dyeing, embroidering, and weaving, and their attire was both convenient and beautiful. They wore sandals after the style of the Egyptians, and their fabrics were largely of flax and cotton.

The Greeks, who idealized the human form in art, sought to maintain grace and beauty in their clothing and wore garments that gave perfect freedom of action to the body. The *chiton*, a close-fitting but long garment, worn both by men and women corresponded to the modern shirt. Over this the men wore the *himation*, which was open on one side, and the women used a girdle around the waist and a *peplos*, a sort of woolen shawl, as an outside garment. A breast support was worn by both Greek and Roman women, but this differed from the modern brassiere in consisting of a single band of cloth. Though the character of dress in Greece

head-wreaths, *sandals* or shoes, and a legging in the form of high military buskin for protection against extreme cold were common.

The barbarians of Northern Europe wore loose garments made principally of wool, and their chiefs had shirts with sleeves. Their dress was greatly influenced by the Roman invasion, but from them the Romans came to value the *trousers* as of practical utility. However, they are not the originators of this garment; this distinction belongs to the Aryan people of Asia, who came across the mountains into the valley of the Euphrates; from them trousers came to be introduced among the people of Europe. While the Chinese and Japanese have steadily held to the dress worn from a remote period in history, the people of Europe, on the other hand, acquired a love of change in the form of dress. Careful cutting and fitting displaced the simple and loose garments of the early centuries of the Christian era, and the clothing came to be firmly sewed and closely fitted. The loose garments gave way to the coat, vest, and pantaloons worn by men, who laced or buttoned their garments tightly and dressed the feet and legs by using tight-fitting stockings and shoes.

About the 13th century, women began to wear the *hennin*, a very large covering of the head. Later the *miter* and the *horned headdress* coverings for the head became celebrated, against which sermons were preached from the pulpit until they went out of use about the 16th century, but were followed by the grotesque and peculiar footwear. The *corset* came into use about the time of Catherine de Medici, and starch was

employed largely in preparing the absurd dresses and enormous ruffs of the time of Queen Elizabeth. In 1583 Stubbs wrote: "There is a certain liquid matter which they call starch wherein the devil hath learned them to wash and dye their ruffs, which being dry will then stand stiff and inflexible about their necks." The *farthingale*, a contrivance which extended the skirts out at the hips, came into use among women about this time, when all of the clothing tended toward excess in shape and ornamentation.

The French Revolution was followed by a tendency to simplify eccentric apparel, and may be said to be the beginning of the modern era of fashions. At present the older European costumes are worn only in isolated or remote sections, while the styles in western dress are more or less similar and are changed quite uniformly. The style of dress changes more readily among Europeans and Americans than among any other class of people, and may be said to be transitory as compared with the styles of the peoples of Asia and those not materially advanced in civilized art. However, to a certain extent, fashion revolves in cycles, certain modes recurring from one period to another, such as the pompadour, the tricorn, the ruff, the use of feathers, flowers, fringe, and other ornamentation. A well-concerted movement for dress reform was inaugurated in 1873, under the auspices of the Crown Prince of Saxony, Germany, who pointed out the evils of unhygienic clothing worn by women. The following year the National Dress Association was formed at Boston; this declared against shoes with high heels and pointed toes, against wearing heavy veils, against the use of tightly laced corsets, and against garments that lodge a heavy weight on the hips.

Modern dress, especially for women, influenced by progress in science and democratic ideals, is more or less standardized, thus somewhat eliminating class distinctions in attire. Women's emancipation since the beginning of the 20th century has resulted in adoption of more practical styles, including sports clothes which give greater freedom of movement, such as tailored suits, slacks, shorts, simple jumpers, culottes, and low-heeled shoes.

For many years style in men's clothes was set by London tailors, while Paris ruled the feminine fashion world. Today the U.S., and especially New York City, has made great strides in the manufacture of ready-to-wear garments, thus promoting American-designed modes. See also color plates, *Costumes of the Ancient East*, *Costumes of Greece and Rome*, *Costumes of the Byzantine and the Middle Ages*, *Costumes of the XV Century*, *Costumes of the XVI Century*, *Costumes of the XVII Century*, *Costumes of the XVIII Century*, *Costumes of the XIX Century (1800-50)*, Volume

III; *European Folk Costumes*, *Slavic Folk Costumes*, *American Costumes*, Volume IV.

Drew (*drōō*), DANIEL, capitalist, born at Carmel, N.Y., July 29, 1797; died Sept. 19, 1879. His early employment was that of a cattle drover, but he later engaged in steamboat and railroad enterprises, and speculations on Wall Street. By successful management he amassed a fortune estimated at \$12,000,000, but subsequent losses caused him to go into bankruptcy. During his time of prosperity he showed a philanthropic spirit in donating to various educational and benevolent institutions, among them the Drew Theological Seminary (New Jersey), the Wesleyan Univ. (Connecticut), and the Drew Ladies' Sem. (Carmel, N.Y.).

Drew, JOHN, actor, son of John Drew and Louisa Drew, born in Philadelphia, Pa., Nov. 13, 1853; died July 9, 1927. He was trained by his parents, both noted as actors, and made his first appearance at the Arch Street Theater, Philadelphia, in 1872. Three years later he began to act with much success at the Fifth Avenue Theater, New York City, where he played successful roles under Fanny Davenport, Edwin Booth, and other celebrated actors. From 1880 until 1892 he played almost continuously with the Augustin Daly Company and in the meantime visited Europe. He began to star on his own account in 1892 and appeared in: "The Butterflies," "The Liars," "A Marriage of Convenience," "The Masked Ball," "The Duke of Killiecrankie," and "Richard Carvel." He took part in the classic comedies as *Charles Surface* in "The School for Scandal" and as *Petruchio* in "The Taming of the Shrew."

Drexel (*drēks'el*), ANTHONY JOSEPH, banker and philanthropist, born at Philadelphia, Pa., in 1826; died at Carlsbad, Bohemia, June 30, 1893. He joined the banking house of Drexel & Co., Philadelphia, at the age of 13 years. At the death of his father he succeeded to the management and extended the business by establishing branch offices in New York, London, and Paris. In 1876 he united with the Rothschilds and others to form a syndicate, which placed on the market bonds of the U.S. amounting to \$300,000,000 at four and one-half per cent. He negotiated loans and stocks for various railroads, canals, and improvement companies. His estate at the time of his death was estimated at about \$30,000,000. He endowed a number of philanthropic institutions throughout the U.S.

Drexel Institute of Technology, an institution of higher learning, founded in 1891 by Anthony J. Drexel of Philadelphia, Pa., for the instruction of both men and women in art, science, and industry. The degree-granting departments have a total enrollment of 3,500 and include a Coll. of Business Administration, a Coll. of Engineering, a Coll. of Home Economics, and a

Graduate School of Library Science. In the Coll. of Engineering, a five-year cooperative course is given, students after the first year being assigned to selected employments in industrial plants; similar opportunities for study under the co-operative plan are available also to students attending the Colls. of Business Administration and Home Economics. Instruction for part-time students of industrial and technical subjects is offered in the Drexel Evening School, which has an enrollment of about 3,400. Dormitory accommodations for women students are provided in the Sarah Drexel Van Rensselaer Dormitory. The Drexel Institute library has a collection of approximately 100,000 volumes. The value of buildings and equipment is \$4,655,500; endowment \$3,039,000.

Dreyfus (*drä'fús*), ALFRED, French military officer, born in Alsace, France, Oct. 9, 1859; died in 1935. He was educated for a military career, and became captain in a regiment of artillery. In 1894, he was accused of having committed treason at the time he held an office in the second bureau of the general staff. The charge brought against him was an accusation of having sold some secrets to certain military officers of Germany. He insisted upon his innocence, but was publicly degraded and in 1895 was imprisoned on the Ile du Diable

pardoned. It became evident that the case rested upon a forgery made by Major Esterhazy, who was envious of the accused. In 1903 the case was again reopened and after three years he was adjudged innocent and was restored to his position in the army. He retired with the rank of major in 1907.

Dreyse (*drī'zē*), JOHANN NICHOLAS, inventor, born in Sömmerda, Germany, Nov. 20, 1787; died Dec. 9, 1867. He learned the occupation of a locksmith in the shop of his father, and followed his calling at Altenburg and later at Dresden. In 1809-14 he was employed at a gun factory in Paris, working under Pauli, a Swiss officer patronized by Napoleon I. After the fall of Napoleon, he returned to Prussia and established a factory for making machinery and utensils. In 1827 he invented the needle gun without breech-loading and completed the breech-loading needle gun in 1836.

Drift (*drīft*), a loose accumulation of transported matter, constituting a peculiar geological formation found in the northern part of Europe and Asia and the eastern and central portions of North America. The drift matters consist of various forms of earth, which in many places are from 50 to 100 ft. in thickness. The surface of drifts is usually smooth with parallel ridges extending for some distances, and at places one set crossing another deposited at an earlier age. Extensive beds of gravel, pebbles, and sand that characterize the drifts are thought to have originated from adjacent rocks, while large stones show from their composition that they were carried long distances. Many of the larger rocks and boulders weigh from 100 pounds to several tons. Those found in the northern drift of Europe extend to about 50° N. lat. and in North America to about 40°. A similar drift is found in the Southern Hemisphere; the drift disappears between 40° and 50° S. lat. These drifts are more marked as one approaches the Poles and gradually diminish in thickness toward the Equator. Near the Equator several similar drifts are found, though these are deposited usually around some great mountain, and traces of their movements are evidenced by scratches and erosion on the boulders of the mountain region.

The cause of drifts is attributed to the action of ice moving southward largely in the form of glaciers. The theory includes the view that in ages far remote the polar regions possessed a warm climate, which later gave way to cold, thus causing the formation of great fields of ice in the high latitudes. Fed by the polar snows, immense glaciers moved toward the Equator and melted as they reached the warmth of the lower latitudes. In this movement the great sheets of ice smoothed the surface of the rock and made scratches and erosions until they melted in the sun of warmer regions. Many of the boulders and gravel found



Courtesy Brown Bros., N. Y.

ALFRED DREYFUS

(Devil's Island) off the coast of French Guiana. Soon after, a movement was begun to collect facts which would prove his innocence, but no material progress was made until Emile Zola wrote a famous letter, in which he charged the general staff of the army with conducting a biased trial and suppressing proofs of the innocence of Dreyfus. This affair caused much excitement in France for more than five years. The case was reopened for trial in 1899 and his punishment was fixed at imprisonment for 10 years, but he was soon

in all portions of the drift region bear evidence that they were moved long distances and dropped from the glacier carrying them as the warmer regions were reached.

Drill (*dril*), metallic tool to bore holes in hard substances, such as stone, metal, wood, or ivory. The form and size depend upon the material in which the work is done. In stone drilling the tool has either a rotary movement or is lifted and dropped alternately. The drills for rock boring are made largely with black diamond, which constitutes the cutting edges. In metal and wood the action is rotary and the tool is made with two cutting edges, against which the work is pressed as the drill revolves.

Drilling (*dril'ing*), a method of sowing seeds in parallel rows instead of planting them in hills or sowing them broadcast. Among the crops commonly drilled are peas, beans, carrots, onions, and other vegetables. These are cultivated more easily and the ground is kept in better condition when drilled so machine cultivation can be introduced. Seeds generally sown broadcast, such as wheat, barley, and flax, are sometimes drilled in rows close together, especially in poor soil, where bone dust or other fertilizing is needed. Corn is sometimes drilled, but is generally planted in hills, as cross cultivation is possible when parallel rows extend in two directions at right angles.

Drinkwater (*drink'wa-tēr*), JOHN, poet, playwright, born at Leytonstone, England, 1882; died in 1937. After a high school education, he was an insurance clerk for 12 years, during which time he became interested in the theater. He founded the Pilgrim Players, later known as the Birmingham Repertory Co.

His books include: "Poems, 1908-1914," "Tides" (1917), "Preludes" (1920), "Mr. Charles, King of England" (1926), and the autobiographies "Inheritance" (1931) and "Discovery" (1932). Among his many plays are: "Abraham Lincoln" (1918), "Loyalties" (1919), "Mary Stuart" (1921), "Oliver Cromwell" (1921), "Bird-in-Hand" (1928), and "A Man's House" (1934).

Dromedary (*drūm'ē-dā-rī*), the Arabian camel, so called from its ability to travel with much speed. It differs from the Bactrian camel in that it has a single hump on its back. The name is applied commonly only to one-humped camels that are noted for their swiftness in travel. See *Camel*.

Drop (*drōp*), a small globule of liquid having approximately spherical shape. It may be formed after a liquid emerges from a jet or by the condensation of vapor. All drops from a given jet travel with the same speed and trace out the same trajectory. Drops formed by condensation of vapor in the atmosphere fall as rain. These condense upon smoke and dust particles as nuclei.

Drosophila Melanogaster (*drō-sōf'i-lā mēl-*

ā-nō-gās'tēr), scientific (Latin) name for the fruit-fly on the study of which much of our knowledge of heredity is based. Thomas Hunt Morgan (*q.v.*) and his students found that *Drosophila* is ideally suited for experimental breeding. At the age of 12 days these little flies begin to breed, and by the end of three weeks a single female can produce 300 offspring. Accordingly, within 3 years it is possible to study more than 60 generations of *Drosophila*—or about as many generations as have accrued to mankind during all the Christian era. The laws of heredity, as worked out in *Drosophila* and other lower forms, have proved to be generally applicable to man and all other higher organisms.

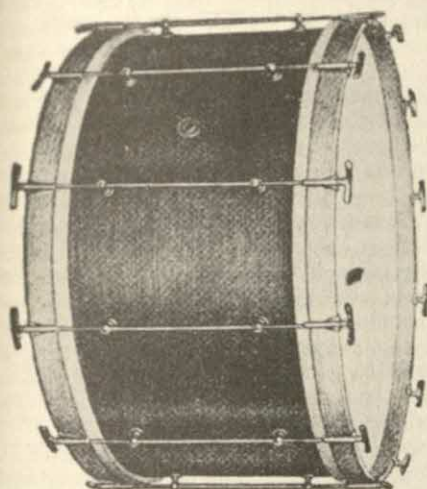
Drowning (*droun'ing*), the form of death that results from suffocation in water or other liquids. It was employed as a mode of capital punishment in many European countries, but long since went out of use as a form of punishment in practically all parts of the world. This method of execution was abolished in Switzerland in 1652, Scotland in 1685, Austria in 1776, and Iceland in 1777.

The deaths which result from drowning at the present time are due largely to accidents, and by careful treatment life may be restored within a limited time after breathing has ceased. Recovery is possible only so long as the heart beats; after that it becomes impossible. That death resulted from drowning is evidenced by finding water in the lungs. In one or two minutes after submersion insensibility ensues and death occurs in from two to five minutes. See *First Aid*.

Druids (*drōo'idz*), the priests of the early Celts of Gaul and Britain. Little is known of them, though Julius Caesar gave some details of interest in regard to their worship and manner of living. He reported that they possessed chief authority among the Celtic people; that they had some knowledge of mathematics, philosophy, and astronomy; and that their religion was similar to the forms practiced by the Brahmins of India, the Chaldeans of Syria, and the Magi of Persia. They acted as judges, possessed complete control over the people, and were the teachers of the young. Their worship was in groves, and human sacrifice was not uncommon. The mistletoe and oak were sacred in their worship. A chief druid was elected by the people, and held his office for life. Ruins of their stone temples are still found in France and Great Britain. They were suppressed or exterminated at the time of the Roman invasion.

Drum (*drūm*), a musical instrument of great antiquity. Several forms are in use. The common drum is made by stretching parchment over the heads of a wooden cylinder or a metallic vessel, which may be slackened or tightened at will by means of cords attached to screws or sliding

knots. The drum mostly used is the *long* or *bass drum* with two heads, on both ends of which playing is done with stuffed-knob drumsticks. Another kind is the *side drum*, having two heads, the upper being the only one played by means of



BASS DRUM

two sticks of wood; the lower head is formed with strings of catgut stripped across its surface. This kind is commonly called a *snare drum*. Another kind is the *kettledrum*, which is usually employed in pairs. It is formed of hollow brass or copper basins, on which a parchment is fastened by means of an iron ring. These instruments are used mostly in orchestras and military bands, where they are called *tympani*. The ancient Egyptians employed them in martial music and, like the Indians, beat their long drums with the hands. Bacchus is said to be the inventor of the drum. It is reputed that he gave the signal of battle by means of that instrument and the cymbal. The sculptures of Egypt and other ancient countries contain numerous inscriptions of drums, illustrating their use in military parades and in the conflict of battle.

Drum, HUGH ALOYSIUS, soldier, born in Ft. Brady, Mich., Sept. 19, 1879. Son of a U.S. army captain, who was killed in the battle of San Juan Hill, Cuba, Drum graduated from the Army Staff Coll. (1912). He participated in the Philippine Island campaign (1898-1901) and the Mexican Border campaign (1914). When the U.S. entered World War I, Drum was assigned to the General Staff and went to France as assistant chief of staff under Gen. Pershing. He was Chief of Staff, 1st Army, A.E.F., July 1918 to April 1919 and Assistant Chief of Staff for Operations and Training in Washington, D.C. (1923-26). He was promoted to Inspector General of the U.S.

Army (1930), commanded the Hawaiian Department (1935-37), was raised to lieutenant general (1939), became head of the Eastern Defense Command and the 1st Army (1940), but retired from active duty (Sept. 30, 1943). Before leaving the



U. S. Army Signal Corps Photo

HUGH A. DRUM

Regular Army, Gen. Drum took charge of the New York State Guard and also accepted his first civilian job as president of the Empire State Building, Inc. (1944). He died on Oct. 3, 1951.

Drummond (*drum'mund*), HENRY, clergyman and scientist, born in Stirling, Scotland, in 1851; died Mar. 11, 1897. He was educated at the Univ. of Edinburgh and in Germany, and was ordained as minister of the Free Church. In 1877 he was chosen professor of science in the Glasgow Free Church Coll., in which and in the lecture field he attained much success. He traveled in America and Africa for geological research and scientific inquiry into the life and habits of various unknown species of insects and animals. His writings on scientific subjects and lectures relative to foreign travel attracted much attention. His religious work carried on in the colleges of Scotland and England ranked high in the light of reform; he effected by his advanced and forcible teaching a wholesome change in the atmosphere of college and university life. Among his writings are: "Tropical Africa," "Natural Law in the Spiritual World," "The Greatest Thing in the World—Love," and "The Ascent of Man."

Drummond Island, an island in Lake Huron, one of the Manitoulin group, forming a part of Chippewa County, Michigan. It is about 10 m. wide and 20 m. long.

Drummond Light, an intense light invented by Thomas Drummond, Scottish engineer, in 1826. It is produced by turning two ignited

streams of gas, one of hydrogen and the other of oxygen, upon a ball of lime. This light was first used in the coast survey service by placing it in a peculiarly shaped mirror, which served to reflect the rays in converging lines so the entire light was focused toward a central point. The light can be thrown in a straight line a distance of about 100 m.

Drummond, THOMAS, engineer, born in Edinburgh, Scotland, in 1797; died Apr. 15, 1840. He studied at the high school of Edinburgh and later at the Royal Military Acad., Woolwich, and was noted as a student in mathematics. In 1815 he entered the Royal Engineers, and subsequently assisted Col. Colby in the trigonometrical survey of the United Kingdom. He is the inventor of the lime-ball light, known as the *Drummond light* (*q.v.*). In 1835 he became Undersecretary for Ireland.

Drummond, WILLIAM, poet, born at Hawthornden, near Edinburgh, Scotland, Dec. 13, 1585; died Dec. 4, 1649. He studied at the high school and the university of his native city, graduating in 1605, and spent several years in traveling on the continent. After 1609 he resided at Hawthornden and gave his attention to literary pursuits. Ben Jonson visited him in 1618 and an account of the visit is preserved in Drummond's "Notes of Ben Jonson's Conversation with William Drummond." He was attached to the High Church principles of the Jacobites, and was the first Scottish writer to displace the native dialect by using the language of the Elizabethan

writers. He wrote a history of Scotland and published: "Poems," "A Cypress Grove," and "Tears on the Death of Meliades."

Drummond, WILLIAM HENRY, physician and surgeon, born in Leitrim County, Ireland, Apr. 13, 1854; died Apr. 6, 1907. He came to Canada at an early age and attended McGill Univ., obtaining a medical degree, and in 1884 began to practice at Montreal. He lectured before many literary societies and mixed audiences in Canada and the U.S., and is the author of poetic works and many verses in the French-English dialect. His books include: "Johnnie Courteau," "The Habitant, and Other French-Canadian Poems," "The Voyageur," and "Phil-O-Rum's Canoe."

Drury Lane (*drú'ry lán*), a street in London, England, which connects Aldwych with Broad Street and High Holborn. It owes its name to Sir William Drury who is said to have lived there during the reign of Henry VIII (1491-1547). In the 17th century aristocratic residences were located there, among them that of Oliver Cromwell (1599-1658).

Drury Lane Theater, the most famous old English playhouse, built in 1663, and originally called the *Theater Royal*. Destroyed by fire in 1672, it was built anew according to plans designed by Sir Christopher Wren (1632-1723). Unfortunately, this building did not last. A new structure was erected, 1791-94, to be destroyed by fire in 1809. The present building was completed in 1812.

Druses (*drōō'zez*), a peculiar political and re-

DRURY LANE THEATER, COMPLETED 1812



ligious people inhabiting the mountains of Lebanon and Anti-Lebanon. They are of mixed Syrian and Arabian origin and combine certain tenets of the Mohammedan with several of the Christian religion, and constitute a secret religious society. Their origin is found in El-Hakim Biamr-Allah, the sixth Fatimite caliph of Egypt, a fanatical ruler who lived in the 11th century. According to tradition he disappeared from his subjects while walking in the vicinity of Cairo, and his followers were led to believe in his future return to earth to reign over them, though the natural explanation is that he was probably assassinated. A Russian named Ismail ed Derazi proclaimed the tenets of the Druses with such zeal in Lebanon that the converts were named after him and not after El-Hakim. They number between 75,000 and 100,000, are engaged largely in producing and manufacturing silk, and are noted for their sturdy resistance to Turkish dominion.

The Druses believe in the unity of God, who, they think, was manifested in the person of several individuals, but last of all in El-Hakim. Their day of worship is Thursday and their doctrines hold strictly to the transmigration of souls. In 1860, 12,000 Maronites were cruelly massacred by the Druses, when neither male nor female children were spared. The uprising was about to terminate in a general conflict between Christians and Mohammedans, but was suppressed by the arrival of French and Turkish troops. At present they are guaranteed certain religious and political liberties by Turkey, to which country they pay an annual tax. The three classes into which their adherents are divided include princes, chiefs, and the people. The greatest amount of knowledge obtained of these people was published by a Frenchman named De Sacy in 1838, entitled "An Exposition of the Religion of the Druses."

Drusus (*drō'sūs*), MARCUS LIVIUS, Roman patrician who, during the first decade of the first century B.C. attempted to gain political power by revolutionizing the masses. The agrarian laws proposed by him were borrowed from suggestions of the Gracchi (*q.v.*). The senate finally abrogated his laws and he was murdered.

Dryads (*drī'adz*), the tree goddesses or nymphs mentioned in the mythology of Greece. Each dryad partook of the characteristics of a particular tree to whose life she was wedded, and ceased to exist when it was felled or so injured that it withered and died.

Dryden (*drī'dn*), JOHN, English poet, dramatist, and critic; born 1631, died 1700. Poet laureate of England, 1668-88. Dryden was born into a good family, Puritan in its religion and politics. He was given the education of an English gentleman of the time, going first to Westminster and then to Cambridge, from which he took a B.A. degree in 1654.

Both as a boy at school and as a student at Cambridge, Dryden wrote verses which were thought worthy of publication in anthologies, but his first important poem was his "Heroic Stanzas," written in memory of Cromwell (*q.v.*) and published in 1659. Only a year later, in 1660, the poet who had lamented Cromwell published "Astraea Redux," a poem celebrating the restora-



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tion of Charles to the throne and lamenting the years of his absence and the rule of Cromwell and the Puritans. This and other changes of point of view which coincided with changes in government have led to much discussion by biographers and critics of Dryden's political and religious sincerity.

In 1663, with the production of "The Wild Gallant," a comedy, Dryden began a career as a playwright that made him the leading dramatist of his generation and perhaps the most important English dramatist between Shakespeare (*q.v.*) and Shaw (*q.v.*). His first tragedy, "The Indian Queen," which was written in collaboration with Sir Robert Howard, his brother-in-law, appeared in the same year.

In writing plays, Dryden developed a life-long interest in literary theory, especially in its application to the drama. The prefaces to some of his plays (*e.g.*, "The Rival Ladies," written in 1664) and his "Essay of Dramatick Poesie," published in 1668 but written during 1665 and 1666, when the theaters were closed, are notable contributions to English criticism and landmarks of English prose. The "Essay of Dramatick Poesie," which is in dialogue form, urges respect for

classical discipline in the composition of plays but at the same time recognizes the value of the relative freedom allowed the dramatist in the English tradition. It is to this day an important piece of literary criticism. The closing of the theaters also gave Dryden time to write an important nondramatic poem, "Annus Mirabilis" (1667), an historical poem in which Dryden treats the war with Holland and the great plague which had closed the theaters and made him an exile from London.

With the reopening of the theaters, Dryden resumed his career as a dramatist and during his lifetime wrote a great many plays. Among them were successful prose comedies (e.g., "Sir Martin Mar-All"), heroic tragedies in rhyme (e.g., "The Conquest of Granada"), and a blank verse tragedy ("All for Love") modeled on Shakespeare and inviting comparison with Shakespeare by treating the story of Antony and Cleopatra.

In 1681 Dryden produced an important political satire, "Absalom and Achitophel," in which he attacked Lord Shaftesbury for his efforts to exclude the Duke of York from the succession to the throne and to establish the succession of the Duke of Monmouth instead. This was followed in 1682 by another satire, "The Medall," again attacking Shaftesbury, who had been acquitted at his trial and honored by a medal. The year also saw the publication of "MacFlecknoe," a satirical attack upon Shadwell and others of Dryden's literary rivals. "MacFlecknoe" served later as a model for Pope's "Dunciad."

In 1685, coincidentally with the succession of James, a Catholic king, Dryden became a Catholic. His poem, "The Hind and the Panther" (1687), is an allegorical defense of Catholicism. The establishment of the Protestant succession and the coming of William and Mary in 1688 deprived Dryden of his laureateship, which was given with the pension that accompanied it to his rival and enemy, Shadwell. Now completely dependent upon his earnings as a writer, Dryden added to his other works many skillful and successful verse translations of classical poems.

Although modern taste prefers the romantic to the neoclassic poets and consequently tends to depreciate Dryden, his place in English literature is secure. His plays rank with the best produced after the Commonwealth. His critical works are important not only because he presented literary views that were dominant in England for a century but also because he had a mastery of lucid expository prose unequaled by any of the writers who came before him. His satirical verse remained the model of satire for a century of writers and was hardly surpassed even by Pope's; and his narrative and lyric poems are still worth reading and studying.

Dry Ice (*dri'is*). See *Carbon Dioxide*.

Drying Oil (*dri'ing oil*), an oil which, when exposed in a thin film to the air, readily forms a hard, tough, elastic substance. The chemical constitution of such oils is characterized by unsaturated linkages between the carbon atoms. They are vegetable oils, consisting essentially of glycerine in combination with various (oleic or rapic; linoleic, linolenic, oleostearic, ricinoleic, etc.) fatty acids. The characteristics of the individual oils vary according to the particular acid or acids they contain and also according to the manner in which these are combined with the glycerine. The drying power of the oil is dependent upon the relative proportions of the saturated and unsaturated acids present. The higher the degree of unsaturation, the more readily the oil absorbs oxygen from the air and, consequently, the more rapidly it dries. In drying, the oil changes its properties—the most important change is that the solid oxidation product is insoluble in most organic solvents.

Acceleration of the drying can be accomplished with heat or by incorporating compounds of certain metals (e.g., lead, manganese, cobalt, etc.) known as driers.

Common drying oils are linseed, tung (China wood), dehydrated castor, soybean, perilla, and safflower.

Drying oils are used in the manufacture of paints, varnishes, synthetic resins, brake linings, patent leather, oil cloth, floor coverings, and other products.

Dry Tortugas (*dri tór-tōo'gaz*), a group of small islands of coral formation, ca. 60 m. w. of Key West, in Monroe County, Florida. They are low, barren, and mostly covered with brushwood. On Garden Key is Ft. Jefferson National Monument, established in 1935. In the monument area are, besides the ruins of the fort, a bird refuge and abundant marine life. Begun during the Mexican War, the once-notable fort was finished before the Civil War; it was in ruins by 1934. It served as a base against Confederate blockade runners in the Florida Strait and as a military prison during the Civil War.

Dualism (*dū'al-izm*), a philosophical concept which supposes that the world consists of two essentially different and irreconcilable parts, termed sometimes the metaphysical and the physical side, or the spiritual and the materialistic. Whatever may be contrasted, the basic assumption of dualism is the existence of two realms. Therefore, the philosophical concept of dualism is the opposite of monism (*q.v.*).

Various theories of dualism appear in the history of philosophy. The Platonic dualism distinguished between a sensible and an intelligible world; Descartes' (*q.v.*) dualism differentiated between Thinking and Extended Substance. This dualism comes close to the modern concept of



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contrasting mind and matter. Other forms of dualism have been outlined in the philosophical systems of Leibnitz and Kant. The philosophical problem to be explained by the dualistic concept is the interaction and integration of two contrasting elements.

To the religious-minded person, the existence of a spiritual in contrast to a materialistic world is an undisputed fact. The belief in the superiority of the spiritual over the materialistic side is an integral part of all religions.

Du Barry (*dū bā-rē'*), MARIE JEANNE BÉCU, COMTESSE, adventuress in the court of Louis XV of France, born in Champagne, France, Aug. 19, 1746; died on the guillotine in Paris, Dec. 7, 1793. The illegitimate daughter of a seamstress, she went to Paris about 1762 and found work in a milliner's shop. Shortly thereafter she became the mistress of Jean, comte Du Barry, who managed to introduce her at court. The king promptly fell in love with her, and she became his mistress in 1769. To preserve the appearance of respectability she married Du Barry's brother Guillaume. Exercising great influence over king and court, she gradually overcame Louis' attachment to his family and advisers and replaced them with her own friends. With the help of her confidant, the duc d'Aiguillon, she brought about the dismissal (1770) of the duc de Choiseul, the leading French diplomat of the time. When Louis XV died (1774), she was briefly banished from court. In 1793 Robespierre demanded her arrest on charges of conspiracy against the republic; despite her protestations of innocence she was tried and condemned to the guillotine by the revolutionary tribunal.

Dubawnt (*dōō-bant'*), a river in north central Canada. It rises ca. 50 m. n.e. of Lake Athabaska and flows about 600 m. in a generally northeastern direction, through a series of large lakes, into Baker Lake at the head of Chesterfield Inlet, Hudson Bay. The Dubawnt is not navigable for larger vessels.

Du Bellay (*dū bē-lā'*), JEAN, CARDINAL, prelate and diplomat, born 1492; died in Rome, Italy, Feb. 16, 1560. He became bishop of Bayonne (1526), bishop of Paris (1533), and cardinal (1535). He carried out several delicate diplomatic missions in England and Rome and with German Protestant groups. The author of three books of Latin poems, he was a patron of literature and a friend of François Rabelais (*q.v.*). Du Bellay's elder brother Guillaume, seigneur de Langey (1491-1543) was a soldier and diplomat.

Du Bellay, JOACHIM, poet, born in Liré, Anjou, ca. 1522; died in Paris, Jan. 1, 1560. A member of a noble family, he had precarious health and an unhappy youth. In 1547 he studied law near Poitiers, where he met Pierre de Ronsard (*q.v.*), whom he later followed to Paris. They and several other young poets felt the need to study closely the Greek and Roman masters as a basis for perfecting the French language as a vehicle of poetic expression. They believed that poets were God's chosen artists, who served the cause of "beauty" and the national genius of France. The seven poets who followed this discipline were known as the Pléiade, and it was Du Bellay who summarized their doctrine in his "*Défense et illustration de la langue française*" in 1549. According to this manifesto all previous poets had been mere rhymesters, and French poets who learned to appreciate the ancients would find glory in their sublime mission. Also in 1549 he published a collection of poems entitled "*L'Olive*," the anagram for Viole, to whom he dedicated his poetry.

He spent five years in Rome as secretary to his cousin, Jean, Cardinal du Bellay (*q.v.*). Returning to France in 1557, he wrote during the last few years of his life "*Les Regrets*," "*Les Antiquités de Rome*" and "*Jeux Rustiques*" which won him, along with his old friend Ronsard, the title of royal poet as well as that of "master of the sonnet."

Dubinsky (*dū-bin'skŷ*), DAVID, head of the International Ladies Garment Workers Union, born in Brest-Litovsk, Polish Russia, Feb. 22, 1892. He began his labor activities at the age of 15, when he led a strike against his father's bakery. In 1909 he was banished to Siberia but escaped and came to the U.S. (1911). He learned the cloak-cutting trade and joined Local 10 of the I.L.G.W.U. By 1921 he was manager-secretary, becoming vice president, 1922, secretary-treasurer in 1929, and in 1932 he was elected president.



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O'CONNELL STREET, DUBLIN'S MAIN STREET

One of the oldest streets in the city, it was rebuilt after being shelled and gutted during the war against English rule, 1916-1921

Two years later he also gained a vice presidency in the A.F.L. When the move to replace craft unions with industrial unions began, Dubinsky resigned (1936) from the A.F.L., and his union joined the C.I.O. In the same year he helped to establish the American Labor Party in New York State, but in 1942, believing the A.L.P. to be too much under Communist influence, he broke with it and became a founder of the Liberal Party. In 1945 he brought the I.L.G.W.U. back into the A.F.L. and was again elected to the executive council of that body. He was instrumental in founding (1947) Americans for Democratic Action, a semi-political national organization, not affiliated with any political party.

Dublin (*dūb'lin*), in Irish, *Baile Átha Cliath*, a city in Leinster province, eastern Ireland, capital of Ireland and county borough of County Dublin (area, 356 sq. m.; population, 1951, 691,428), on Dublin Bay at the confluence of the rivers Liffey and Dodder. It is the commercial and industrial center of the republic and the terminus of an extensive network of roads and railroads which converge on the city from every part of Ireland; it is also the terminus of the Grand and Royal canals, which connect the port with the interior. Dublin is the principal Irish seaport,

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importing large quantities of coal and exporting livestock, malt beverages, foodstuffs, and hides and skins. Brewing is the city's largest single industry, but there are also manufactures of clothing, chemicals, soap, textiles, thread, carpets, lace, and machinery. A silk industry, established here by Huguenot refugees in the 18th century, manufactures silk poplins.

The Univ. of Dublin, also called Trinity Coll., is said to have been established (1591) by Elizabeth I of England; its library contains, among other national treasures, the Book of Kells, an 8th-century illuminated manuscript of the Latin Gospels. Other institutions and points of interest in Dublin are University Coll., incorporated (1909) as part of the National Univ. of Ireland; the national museum, with a fine collection of Irish antiquities; the National Gallery of Art; and the Royal Zoological Society. Dublin Castle, begun in 1205, and residence of the Lords Lieutenant of Ireland until 1922, now houses government offices. In Dublin is the national cathedral of the Protestant Church of Ireland, St. Patrick's, the burial place of Jonathan Swift, who was its dean (1713-45). Christchurch is Dublin's oldest church, founded in 1038 and rebuilt in 1172. The Catholic cathedral, St. Mary's, was built in the early 18th century. Dublin is the site of the world-famous Abbey Theater (*q.v.*).

In the 10th century Dublin was a stronghold of Danish Vikings; they were defeated by Brian Boru in the battle of Clontarf (1014) but maintained their hold on the city until 1171, when the earl of Pembroke seized it for the English. In 1209 the Black Monday massacre of Dublin's English residents occurred. In the civil war Dublin yielded (1647) to parliamentary forces, and Oliver Cromwell landed here two years later. In 1689 Dublin was occupied by William III after the battle of the Boyne (*q.v.*). It was the scene of the uprising (1803) of Robert Emmet (*q.v.*) and the so-called Easter Rebellion (1916) against the British. Population, 1951, 521,322.

Du Bois (*dō-bois'*), a city in Clearfield County, Pennsylvania, 48 m. n.w. of Altoona, on Sandy Lick Creek. Du Bois is served by the Baltimore & Ohio and Pennsylvania R.R.'s and has railroad repair shops as well as manufactures of metal products, concrete blocks, bricks, foodstuffs, and lumber. In the vicinity of the town are soft-coal fields and a rich agricultural area. Du Bois Undergraduate Center of Pennsylvania State Coll. is located here. The town was settled in 1865 and incorporated in 1881. Population, 1940, 12,080; in 1950, 11,497.

Dubois (*dū-buä'*), FRANÇOIS CLÉMENT THÉODORE, organist and composer, born in Rosnay, France, Aug. 24, 1837; died in Paris, June 11, 1924. He was graduated (1861) from the Paris Conservatoire, where he became (1871) professor

of harmony. He followed (1877) Saint-Saëns as organist at the Church of the Madeleine in Paris and succeeded (1894) to Gounod's seat in the Académie des Beaux-Arts. From 1896 to 1905 Dubois was director of the Paris Conservatoire. He composed many orchestral works, cantatas, and masses; the cantata "*Les Sept Paroles du Christ*" (The Seven Last Words of Christ, 1867) is his best-known work. He also wrote a grand opera, "Aben Hamet" (1884).

Dubois, GUILLAUME, CARDINAL, born at Brives-la-Gaillarde, Corrèze, France, Sept. 6, 1656; died in Versailles, Aug. 10, 1723. During the minority of Louis XV, when Philippe, duke of Orléans was regent, Dubois became (1715) counselor of state. He negotiated the Triple Alliance between France, England, and Holland (1717) and arranged (1719) marriage contracts between the royal houses of France and Spain. He became chief minister in 1722.

duBois, GUY PENE, painter, born in Brooklyn, N.Y., Jan. 4, 1884; died in Boston, Mass., July 18, 1958. After studying in New York (with William Chase) and in Paris, he became (1906) an art critic in New York. In addition to his writing, he is known for his portraits ("Jeanne Eagels in 'Rain'," 1922) and for his social satires ("Waiter!," 1910), which suggested psychological relationships and atmosphere through his realistic technique. His paintings hang in the Metropolitan Museum of Art, the Whitney Museum of American Art, and the Museum of Modern Art. He wrote an autobiography, "Artists Say The Silliest Things" in 1940.

Du Bois (*dōō boi's*), WILLIAM EDWARD BURG-HARDT, editor and author, of Negro descent, born in Great Barrington, Mass., Feb. 23, 1868; died in Accra, Ghana, Aug. 27, 1963. He was educated at Harvard Univ. A cofounder (1909) of the National Assn. for the Advancement of Colored People (*q.v.*), he resigned from the organization in 1934, returned in 1944, and left again in 1948. In 1959 he won the Lenin Peace Prize. Long associated with leftwing organizations, in 1961 he joined the Communist party in the U.S. In that year also he was named to plan the publication of an "Encyclopedia Africana." In 1963 he relinquished U.S. citizenship to become a citizen of Ghana. Among his many books are "Color and Democracy" (1945) and "Worlds of Color" (1961).

Du Bois-Reymond (*dū bwā'rā-mōn'*), EMIL, physiologist, born in Berlin, Germany, Nov. 7, 1818; died there Dec. 26, 1896. He studied anatomy and physiology at the Univ. of Berlin and became professor of physiology there in 1855. In 1867 he was appointed perpetual secretary of the Acad. of Sciences of Berlin. Du Bois-Reymond's most important work was a series of researches and discoveries in animal electricity and the

functions of the nerves, the results of which were published in his "*Untersuchungen über tierische Elektrizität*" (Investigations into Animal Electricity, 2 vols., 1848-84) and "*Gesammelte Abhandlungen zur allgemeinen Muskel- und Nervenphysik*" (Collected Treatises on General Muscle and Nerve Physics, 2 vols., 1875-77).

Dubos (*dū-bōs'*), RENÉ JULES, bacteriologist, born in Saint-Brice, Seine-et-Oise, France, Feb. 20, 1901. He received a B.S. (1921) from the Institut National Agronomique in Paris and a Ph.D. (1927) from Rutgers Univ. In 1927 he joined the Rockefeller Inst. for Medical Research and in 1938 was naturalized as a U.S. citizen. Dubos isolated from certain soil bacteria an antibiotic substance useful in treating bacterial infections.

Dubrovnik (*dōō'brōv-nĕk*). See *Ragusa*.

Dubuque (*dū-buk'*), a city in eastern Iowa, seat of Dubuque County, on the Mississippi River, 60 m. N.E. of Cedar Rapids. It is served by the Illinois Central, the Chicago Great Western, and other railroads; the Mississippi is bridged here. The city is the trading and shipping center for a rich agricultural region. Its industries include railroad shops, shipyards, foundries, meat-packing, and the manufacture of lumber and metal products and agricultural machinery. It is the center of the Dubuque S.M.S.A. (pop., 1960, 80,048), which includes all of Dubuque County and in 1958 had a value added by manufacture of \$99,379,000; the figure for the city alone was \$71,600,000. Dubuque is the seat of Wartburg Theological Sem., the Univ. of Dubuque, Loras Coll., Clarke Coll., and St. Raphael's (Roman Catholic) Cathedral. The burial place of Julien Dubuque, the first settler, and New Melleray Abbey, a Trappist monastery, are located nearby. One of the oldest towns in Iowa, Dubuque was settled in 1788. Its real growth began after 1832, when the Black Hawk treaty ended the Indians' title to the territory. It was chartered as a city in 1841. Population, 1950, 49,671; in 1960, 56,606.

Ducat (*dūk'at*), any of numerous coins, usually of gold and of varying values, formerly used in Europe. The first ducat was struck about 1150 by Roger II of Sicily as duke of Apulia, and the word is supposed to be derived from the Latin word for dukedom. Other countries which coined ducats included Venice, Austria, the Netherlands, Great Britain, Spain, and Denmark.

Duccio di Buoninsegna (*dōō't'chō dē bwō-nĕn-sā'nĕyā*), painter, born ca. 1255; died in Siena, Italy, Aug. 3, 1319. Duccio was the outstanding representative of the Sienese school, which clung to the anti-naturalistic formulas of Byzantine art long after the beginning of the Renaissance. Duccio's first important work was probably the "Ruccellai Madonna" (1285), in which he added a new sweetness and grace to its Byzantine impressiveness. But Duccio's long-

lasting influence on Siene painting stems principally from his great altarpiece for the Cathedral of Siena (1311). In the front panel of the "Virgin in Majesty," and in the 40-odd small panels of the back, depicting the life of Christ, Duccio combined the Siene feeling for curvilinear decoration and picturesque narrative in an elegant manner which guided Siene painting for two centuries.

Du Chaillu (*dū shā-yü'*), PAUL BELLONI, explorer and writer, born in France, July 31, 1835; died in St. Petersburg (Leningrad), Russia, April 30, 1903. He grew up in the Gaboon, in West Africa, and came to the U.S. in 1852. Supported by the Philadelphia Acad. of Natural Sciences, he traveled in Central Africa from 1856 to 1860, collecting rare bird and animal specimens. He brought back the first gorillas ever seen in the U.S. After another journey in Africa (1863-65) he settled in New York City, writing and lecturing. He traveled in Sweden and Norway (1871-76) and died in Russia while on a similar trip there. His books include "The Country of the Dwarfs" (1871) and "The Viking Age" (1889).

Duchamp (*dū-shān'*), MARCEL, painter, born in Blainville, France, July 28, 1887. The brother of two outstanding contemporary artists, Raymond Duchamp-Villon (1876-1918) and Jacques Villon (1875-), Duchamp received much publicity for his leadership in controversial art movements of the early 20th century. His "Nude Descending a Staircase" (1912), a study in movement which employed techniques related to Cubism, was the sensation of the New York Armory Show. (This exhibition, held in 1913, introduced advanced French art to an astounded American public.) Duchamp continued to experiment with unusual media, and with "readymades," witty assemblies of ready-made objects, bearing such surprising titles as "Why Not Sneeze?" (a bird cage filled with marble cubes), which he exhibited with a Dada group, followers of a movement which aimed at conscious madness (see also *Dadaism*). Duchamp abandoned painting in 1923 but occasionally writes on art subjects.

Duchesne (*dōo-shān'*), ROSE PHILIPPINE, educator and missionary, born in Grenoble, France, Aug. 29, 1769; died in St. Charles, Mo., Oct. 18, 1852. She was educated by the Visitation nuns and entered their order, but was forced to leave the convent, in 1791, by the anti-religious decrees of the French Revolution. In 1804 she joined the Society of the Sacred Heart and in 1818 was sent to the U.S. She landed at New Orleans and journeyed up the Mississippi to found the first house of her society in the U.S., at St. Charles, Mo. This was followed by the establishment of girls' schools, missions, and convents in a wide area of the West. She traveled extensively, serving as mis-

sionary to the Indians. She was beatified in 1940.

Duck, the common name of a large family of widely distributed web-footed birds. They include many species and are seen in all portions of the inhabited world. Many ducks are migratory, going to higher latitudes to breed in the summer season. They deposit from 6 to 12 eggs in a nest built among the reeds near the edge of bodies of fresh water, or in the hollows of trees or crevices of rocks. Ducks are peculiarly awkward in walking, having a waddling movement, but their flight is brisk and their ability to swim is quite highly developed. The wild species are classed as sea ducks and true ducks. Ducks of the former class are migratory, being seen frequently in large flocks moving to and from the higher latitudes. The most common wild duck of central North America is the *mallard*, a fine game bird. The female is of a grayish color, while the male has an attractive plumage. In the latter the head is bluish-green, the neck is chestnut colored with a fine ring of white, and the body is finely marked in various light, blue, and greenish shades. In the duck family the bill is large, though it is greatly diversified as to size and shape. Some are flat and rounded at the top, others are quite sharp, while the *scaup duck* has a spoon-shaped bill. The *pin-tail* is characterized by a pointed tail. The flesh of ducks is a wholesome and favorite food and is much sought at all times, except in the season of breeding. Domestic ducks have been developed from the wild species, probably largely from the *wood duck* and the *mallard*. They are grown extensively for the flesh and feathers. The eggs, though excellent food, are not so well liked as hens' eggs. Besides, ducks do not produce eggs abundantly. The *musky duck*, a native of South America, often erroneously called *Muscovy duck*, is almost as large as a goose and is the largest of the duck family. The drake or male of all domestic ducks and of many wild species is distinguished by marked difference in plumage, is somewhat larger than the female, and has four curved tail feathers. Its voice is low and basslike and quite different from the quack of the female.

Duckbill, or WATER MOLE, an aquatic egg-laying animal, the only living species of the order *Monotremata*. It is native to Australia and the adjacent islands, including Papua and Tasmania. The body is about 20 in. long, which includes the bill and tail, and is thickly covered with a brown fur. The head is small, the teeth are near the base of each mandible, and the males have spurs on the hind legs. This animal has a horny bill similar to that of a duck, but it breathes through nostrils at the tip of the bill. Though an aquatic animal, it can climb trees with facility, and is able to dig long burrows with its feet. The fore feet are strong and have five toes, and the hind

feet are smaller and the five toes are armed with claws. It feeds chiefly on worms and insects and prefers to live in large colonies. Reproduction is by eggs, which are covered with a soft and flexible shell, and only a few are laid at a time. At birth the young are blind and naked, but grow rapidly, subsisting on milk drawn from the milk glands of the mother. The duckbill has a gentle disposition and its voice resembles a young dog's.

Ducking Stool, a kind of stool used for punishing scolds. It came into common use in many European countries in the 15th century, and was employed as an apparatus for inflicting punishment in Europe and America until the beginning of the 18th century. In one English parish it was employed as late as 1809. Many forms of ducking stools were used; the most common kind consisted of a mechanical arrangement whereby the culprit was fastened in the chair and moved up and down in the water, the head alone remaining above the surface, though it was sometimes submerged momentarily.

Duckweed, the name of a small plant that floats upon the water, the rootlets hanging loosely beneath. It consists chiefly of flat green fronds and is found widely distributed on the surface of stagnant waters. The flowers are unisexual, destitute of calyx and corolla, and the fruit is rarely seen, since it propagates chiefly by new fronds budding from those already developed.

Ducommun (*dū-kō-mūn'*), ÉLIE, pacifist leader born in Geneva, Switzerland, Feb. 19, 1833; died Dec. 7, 1906. Ducommun devoted his entire life to the cause of international peace. Known as a writer and lecturer, he was made editor of the French periodical *États-Unis d'Europe* when it was founded in 1867 by the International League for Peace and Liberty. He was a delegate to the 1889 and 1890 peace conferences in Paris, and to the 1891 conference in Rome. At the latter conference plans were laid for the International Bureau for Permanent Peace, and when it was established in 1892 Ducommun was made its director. In this post he published the *Correspondence bimensuelle* concerning the bureau's activities. Before retiring in 1903, he also served as editor of the *Revue de Genre* and *Der Fortschritt*, and was awarded the Nobel Prize for Peace (with Albert Gobat) in 1902.

Ductility (*dū-til'i-tē*), the quality of some substances by which they may be drawn into wire. Soft metals possessing only slight ductility cannot be drawn into wire, but may be converted into that form by a process of squirting or pressing. The degree of ductility in the important metals is in this order: gold, silver, platinum, iron, copper, zinc, tin, lead, and nickel. These metals are malleable, that is, they may be beaten into leaves or sheets, but malleability is in a relatively different order, as follows: gold, silver,

copper, tin, platinum, lead, zinc, iron, and nickel.

Dudevant (*dūd-vān'*). See *Sand, George*.

Dudley (*dūd'li*), EDWARD RICHARD, public official, born in South Boston, Va., March 11, 1911. After graduation from Johnson C. Smith Univ., North Carolina, he taught school near Staunton, Va., before studying at Howard Univ. for a year. Going to New York City, he worked his way through St. John's Univ. law school, receiving a degree in 1941. He served (1942-43) as assistant state attorney general, and in 1943 he joined the legal staff of the National Assn. for the Advancement of Colored People, in which post he fought many legal battles on issues involving segregation and equality between the races. Thereafter he was successively executive assistant and legal counsel to the governor of the Virgin Islands (1945-47); the first U.S. Negro ambassador, to Liberia (1948-53); and justice of the New York City domestic relations court (1955-61). In the latter year he was elected by the city council to fill an unexpired term as borough president of Manhattan and subsequently was elected to a full term. In 1962 he ran unsuccessfully as Democratic candidate for attorney general of New York State, the first Negro nominated by a major party to campaign for statewide office in New York.

Dudley, JOSEPH, colonial governor, born in Roxbury, Mass., Sept. 23, 1647; died there, April 2, 1720. He was graduated from Harvard in 1695, studied law and theology, and was a magistrate in Roxbury in 1673. Two years later he negotiated a treaty with the Narragansett Indians. He went to England on behalf of the colonists in 1682 and again in 1693, and was appointed to high offices in New York and New England. He was chief justice of New York from 1690 until 1693, and in 1702 became governor of the colony of Massachusetts, serving until 1715.

Dudley, ROBERT. See *Leicester*.

Dudley, THOMAS, second colonial governor of Massachusetts, the father of Joseph Dudley, born in Northampton, England, in 1576; died July 31, 1653. He served in the army of Queen Elizabeth and in 1630 went to the Massachusetts Bay Colony as deputy governor under Winthrop, serving 13 years in that office. Four times he was chosen governor of the colony, in the years 1634, 1640, 1645, and 1650. He founded Newtown, now Cambridge, Mass., and aided in establishing Harvard Coll. He was twice elected president of the New England Confederation, and was a leader of the party that advocated greater liberty for the colonies.

Due Bill (*dū bīl*), in commerce, a written statement certifying a debt, not made payable to order. In some localities such a statement or acknowledgment issued by a bank takes the place of a certified check (*q.v.*).

In payment for advertising space, etc., hotels

issue due bills for equal value in services and accommodations.

Duel (*dū'el*), a word derived from the Latin *duellum*, signifying a premeditated and prearranged mortal combat between two persons for the purpose of deciding some point of difference, or establishing some question of honor. Dueling was practiced in early ages and is referred to by some writers as a trial by battle. In a modern duel at least four persons are required to be present, including the two *combatants* or *principals* and a *second* for each principal. The seconds arrange the time, place, and mode of fighting the duel, though the choice of arms belongs exclusively to the person receiving the challenge. Modern public opinion has rendered dueling almost obsolete. However, the practice is still regarded as honorable in some countries, particularly in the Latin states of Europe and some countries of Asia.

It is thought that the practice of dueling in modern Europe was the outgrowth of the custom of wearing a sword, and was most common in the 16th century. In the reign of Henry IV of France the number of persons falling in duels is estimated at fully 6,000. Sully, minister of Henry IV, opposed the practice with much energy, but the king favored it, because he thought it tended to maintain a spirit of militarism among the people. A decree was issued against it in 1602, but with little effect. More than 4,000 nobles lost their lives during the minority of Louis XIV. From France the practice was carried to England in the reign of James I, where it became quite common. Among the well-known men who fought duels in England are included William Pitt and the Duke of Wellington. The most celebrated duel occurring in America was the mortal combat between Alexander Hamilton and Aaron Burr, in which the former was slain. Great indignation was aroused among the people in the U.S. on account of the death of Hamilton, and the practice grew less common. It is now looked upon as a rather foolish and inhuman act to issue a challenge.

Duero, or DOURO. See *Douro*.

Duff (*dūf*), ALEXANDER, missionary, born in Perthshire, Scotland, Apr. 26, 1806; died in Edinburgh, Feb. 12, 1878. He was sent to India in 1839 as the first missionary of the Scottish Presbyterian Church. His voyage was endangered by two shipwrecks, but he reached India in the spring of 1840, and entered upon effective work in religious instruction among the natives. A school founded by him in Calcutta soon grew to importance. He returned to Scotland for a short period on account of ill health, but soon after continued his work in the missionary field. After the religious disputes of 1843 he joined the Free Church party of the Church of Scotland. In 1844 the *Calcutta Review* was founded by his assist-

ance. Five years later he returned to Scotland and subsequently made a successful missionary tour in America. Returning to India, he assisted in founding the Univ. of Calcutta, and in 1863 returned to his home where he became professor of New Coll., Edinburgh, in which he taught until his death. His extensive knowledge of the public affairs of India made him an important factor in England.

Dufferin and Ava (*dūf'ēr-in and ā'vā*), FREDERICK TEMPLE HAMILTON BLACKWOOD, MARQUIS OF, British statesman, born at Florence, Italy, June 21, 1826; died Feb. 12, 1902. He was descended from a distinguished family, was educated at Eton and Oxford Univs., and succeeded to the title of Baron Dufferin in 1841, while still in his minority. In 1850 he was created an English baron and served as lord-in-waiting to Queen Victoria for several years. Paying a visit to the south of Ireland during the famine of 1846-47, he wrote a work entitled "Irish Emigration and the Tenure of Land in Ireland." He made a voyage to Iceland in 1853 and shortly after published his "Letters From High Altitudes." From 1860 to 1872 he was prominent in the ministry, and in the latter year was appointed governor general of Canada, in which position he served six years. In 1879 he was chosen ambassador to St. Petersburg, in 1881 was transferred to the embassy at Constantinople, and in 1884 was appointed viceroy of India. He became ambassador at Rome in 1888, was created Marquis of Dufferin and Ava, and was transferred to Paris in 1891, from which embassy he retired in 1896, thus terminating his diplomatic career. His "Speeches and Addresses" was published in London in 1882, and eight years later his "Speeches in India" appeared.

Duffy (*dūf'fī*), CHARLES GAVAN, author and statesman, born in Monaghan County, Ireland, in 1816; died in 1903. He engaged in journalism at an early age and founded the *Nation* in Dublin, which was made the organ of the younger element in Irish politics. This publication was afterward reorganized under the name of *The Irish Confederation*, and in 1848 he was tried for treason and acquitted. He went to Australia in 1856 to engage in the practice of law at Melbourne, and the following year was made minister of public works in Victoria. Subsequently he entered the Parliament of Victoria, and in 1871 was prime minister and was knighted. He returned to Europe in 1880 and took up his residence in France. "Ballad Poetry of Ireland," his most popular work, has passed through fifty editions. Other writings are: "Four Years of Irish History," "Young Ireland," and "Conversations With Carlyle."

Duffy, FRANCIS PATRICK, Roman Catholic clergyman, born in Coburn, Ontario, 1871; died in 1932. Ordained in 1896, Father Duffy was pro-

fessor of logic and metaphysics at St. Joseph's Sem., Dunwoodie, N.Y. (1898-1912). He founded the parish of the Church of Our Saviour in the Fordham section of New York City, serving as rector (1912-19). As chaplain of the 165th Infantry, formerly the 69th National Guard of New York City, he gained fame in World War I. He became pastor of Holy Cross Church, New York City (1920). Associate editor of the *New York Review* (1905-10), he wrote "Father Duffy's Story" in 1919.

Dufy (*dü-fé'*), **RAOUL**, painter, born in Le Havre, France, June 3, 1877; died in Forcalquier, France, March 23, 1953. He worked in Le Havre for seven years before studying art at the School of Fine Arts there. Dufy won his first marked success with his illustrations for "Bestiaire," by Guillaume Apollinaire, in 1911. His reputation increased rapidly and he became known as one of the most sophisticated of modern French painters. He frequently painted social scenes and fashionable centers in a style distinguished by gaiety of color and by lack of detail in figures. These works were exhibited in numerous one-man shows in New York, and formed part of many collections of modern art in the U.S. and abroad. Dufy was also known as an illustrator, engraver, lithographer, and water colorist; in addition, he was one of Europe's best known fabric designers. Among his more popular paintings are "Panorama de Paris," "Bateau au Port," "Nice, le Casino," "Le Parc de St. Cloud," and "Sur le Quai." These paintings are characterized by the peculiar manner in which he applied his medium to his drawing; the color does not always fit the outline of the drawing, but it often overlaps the outline and may leave other spots uncovered.

Dugong (*dōō'gōng*), an herb-eating sea mammal of the genus *Halicore*. Cuvier classed it with his order of *Pachydermata*, which includes the rhinoceros and other thick-skinned animals, but the order is not recognized at present. The eyes are small, the upper lip is thick and fleshy, and the upper jaw bends downward almost at a right angle. It has a whitish color below and a slate-brown or bluish-black above. The common length is 8 or 10 ft., though some are 20 ft. long. It is widely distributed in tropical seas, but is most common in the waters of Southern Asia and the East Indies. Its food is marine vegetation, principally algae, which it finds in shallows or at the river estuaries. The natives pursue it for its flesh, which resembles the beef of young cattle and is highly nutritious. The mother has a feeble voice and shows intense affection for her young. See also *Sirenia*.

Du Guesclin (*dü gâ-klân'*), **BERTRAND**, constable of France, born near Dinans, in Brittany, about 1320; died July 13, 1380. He entered the military service in 1342 under Charles of Blois,

and was an important factor in expelling the English from many parts of France. In 1356 he defeated the Duke of Lancaster at Rennes, but was taken prisoner by the English under the Black Prince in 1367. He was released on the payment of a large ransom and became constable of France in 1369, and expelled the English from nearly every province in France before 1375. He was sent to Languedoc in 1380 to suppress disturbances caused by the harsh rule of the Duke of Anjou, but died before the task was completed.

Duhamel (*dü-â-mêl'*), **GEORGES**, pseudonym of Denis Thévenin, French writer, born in Paris, 1884. Originally a physician, he turned to literature as a profession, and with Jules Romains and Charles Vildrac represents the so-called "unanimist" movement which views man as a member of society rather than an isolated individual and sees the story of humanity in the sociological relations between groups. Duhamel's experiences as a physician in World War I are mirrored in many of his descriptions in "Vie des martyrs," and "Civilization," the book which brought him the important Prix Goncourt and definitely established him as a leading French writer. Among his other works are the plays, "La lumière," "Dans l'ombre des statues," "Le combat," and essays and novels such as "Essai sur le roman," "La nuit d'orage," "America the Menace," and "Why France Fights."

Dühring (*dü'ring*), **EUGEN KARL**, philosopher, born in Berlin, Germany, Jan. 12, 1833; died in 1921. He was educated at Berlin and practiced law, but between 1864 and 1877 he lectured on philosophy and political economy at the Univ. of Berlin, from which position he resigned in the latter year to give his attention exclusively to economical and philosophical subjects. Both in writing and in teaching he was unduly personal and somewhat materialistic, and was opposed to the theory of pessimism and the doctrine of Kant that the categories of time and space have only subjective validity. Some of his writings were widely translated and had general circulation. They include: "Theory of Logic and Knowledge," "Critical History of Philosophy," and "Theory and Logic of the Sciences."

Duisburg-Hamborn (*düs'böörk-hâm'börn*), a city of Germany, 15 m. N. of Düsseldorf. It is located between the Ruhr and the Rhine, with which it is connected by canals, and is the converging center of several railroads. Incorporation of Ruhrort and Hamborn (1929) made it the largest inland port of pre-World War II Europe. Duisburg is an ancient town, but its larger growth dates from the 19th century. Charlemagne fortified it. In the 12th century it became a free imperial city. It passed to Cleves in 1290 and in the 13th century it became a member of the Hanseatic League. It passed to Brandenburg in 1666, and

during the Thirty Years War was alternately in the hands of the Spanish and the Dutch. It was occupied by Allied forces after World War I, and after World War II it was placed in the British occupation zone. Population, 1931, 271,790.

Dukas (dū-kă'), PAUL, composer, born in Paris, France, Oct. 1, 1865; died there May 17, 1935. In 1882 he entered the Paris Conservatory, where he studied under Mathias and Ernest Guiraud, and after six years he received the second Prix de Rome for his cantata, "Velléda." His overture to "Polyeucte" was first performed in 1892 and gained him an important place in French music circles. He became famous for his colorful scherzo, "The Sorcerer's Apprentice" (1897), which made him one of the leaders of the modern French school of music. His opera, "*Ariane et Barbe-Bleue*," based on Maurice Maeterlinck's fantasy, was quite successful when performed in Paris in 1907, and was given its American début at the Metropolitan Opera in 1911. Dukas taught at the Paris Conservatory and was well known as a music critic and writer for music and arts magazines.

Duke (dūk), from the Latin *dux*, meaning leader, a title of nobility, also of the ruler of a small state (a duchy). The title was given to military leaders in Rome in the 2nd century A.D., and gradually became the title of the commanding governors of the Roman provinces. During the early Middle Ages, the provincial leaders in France were also called dukes, and the term was later used in Germany as well. In England the title seems to have been introduced in the 14th century. The Black Prince (*q.v.*) was created Duke of Cornwall in 1337. Only three families now existent in England have held the title of duke since before the revolution of 1668: the Dukes of Norfolk, Somerset, and Beaufort. *Duke of York*, royal title of England, is traditionally bestowed on a son (usually the second), brother, or other male relative of the monarch. Richard II inaugurated the tradition in 1385, naming his uncle, Edmund Plantagenet, Duke of York.

Duke, JAMES BUCHANAN, industrialist, born near Durham, N.C., Dec. 23, 1856; died in New York City, Oct. 10, 1925. With his brother, B. N. Duke, he founded tobacco factories at Durham (1874) and New York (1884). As head of the American Tobacco Co., formed by a merger with rival concerns (1890-1912), he largely controlled the tobacco market of the world.

Trinity Coll. in Durham was renamed Duke Univ. in honor of the Duke brothers, whose gifts for education in North and South Carolina came to a total of more than \$50,000,000.

Duke, VERNON, born Vladimir Dukelsky, composer; born in Pskoff, Russia, Oct. 10, 1903. He received his musical training at the Kiev Con-

servatory. Writing under his own name, Dukelsky wrote the score for Serge Diaghilev's ballet, "Zephyr and Flora," in 1925. His first and second symphonies have been performed in Europe and America. Aside from his serious music, which include a violin concerto (1942), a cello concerto (1945) and a piano sonata (1927), his greatest effort has been directed to Broadway musicals, of which the better known are the scores for the "Garrick Gaieties" (1930), 1934 and 1935 "Ziegfeld Follies," "Cabin in the Sky" (1940), and "Banjo Eyes" (1941). Duke also wrote many popular songs and scores for several films. During World War II he enlisted in the U.S. Coast Guard.

Duke University, an institution of higher learning located in Durham, N.C., founded by James B. Duke, who set up (1924) an indenture of trust, known as the Duke Endowment, and left further bequests at his death (1925). Duke Univ. was built around Trinity Coll., an institution which originated as the Union Inst., established by the citizens of Randolph County, N.C., in 1838. The institution became the Union Inst. Acad. in 1841 and Normal Coll. in 1851, awarding the B.A. degree for the first time in 1853. About 1858 the institution was taken over by the North Carolina Conference of the Methodist Episcopal Church, South, and its name was changed to Trinity Coll., Feb. 16, 1859. Some 30 years later, the generosity of the Duke family and other citizens of Durham, N.C., made it possible to move Trinity Coll. to a new plant in Durham, N.C. (1892). Women were admitted to all departments of the college after May 1897.

Duke Univ. now includes Trinity Coll., the Woman's Coll., the Coll. of Engineering, the Graduate School of Arts and Sciences, the Divinity School, the School of Law, the School of Medicine, the School of Nursing, the School of Forestry, and the Summer Session. The buildings of the various schools and departments are located on two campuses totaling about 5,200 acres. Annual enrollment totals about 5,200 students. The faculty and administration number more than 700 persons. The libraries contain about 1,000,000 volumes. The Duke Hospital is connected with the university.

Dukhobors (dōō'kō-bōrz), a religious sect founded in the 18th century. See *Doukhobors*.

Dulcimer (dūl'si-mēr), a musical instrument, the prototype of our present-day pianoforte (*q.v.*). Originally found in the East, it dates from ancient times and was popular in Europe throughout the Middle Ages. It consists of a flat box with a sounding board crossed by bridges, to which wire strings are fastened and tuned by pegs at the sides. The operator sets the strings in vibration by striking them with small sticks of wood held in each hand, or with two hammers con-

DULLES

taining heads of cork. The dulcimer differs from the psaltery (an ancient string instrument similar to a zither) in the way in which strings are struck—the latter being plucked by the fingers or a plectrum. While the dulcimer led to the development of the pianoforte, the psaltery with its plucking technique gave rise to the development of the harpsichord (*q.v.*). These instruments differ mainly in their tone qualities and technical features.

Dulles (*dū'les*), JOHN FOSTER, lawyer and government official, born in Washington, D.C., Feb. 25, 1888; died there, May 24, 1959. He was educated at Princeton Univ. and the Sorbonne in Paris, and received (1911) an LL.B. degree from George Washington Univ. While still a student he served as delegation secretary at The Hague Peace Conference in 1907. He practiced law with the firm of Sullivan & Cromwell, Inc., from 1911, becoming a partner in 1920 and a senior partner in 1944. Following World War I, in which he served as a major and on the War Trade Board (1918), he was U.S. counsel to the Paris Peace Conference Committee on Reparations.

During the 1930's and 1940's, Dulles interested himself increasingly in foreign affairs and the cause of peace, serving on various commissions and becoming recognized as the foreign policy expert of the Republican party. He served under President Truman as representative to the U.N. General Assembly (1948), adviser to the Secretary of State (1945, 1947, 1949, and 1950), and as special representative to the Japanese Peace Treaty Conference (1951). He was U.S. Senator from New York (1949-50), completing the term of Robert F. Wagner (*q.v.*). In 1953 Dulles was appointed Secretary of State. Among his early acts was negotiation of the Manila Treaty (*q.v.*). His enunciation of the principle of "massive retaliation" against aggressors created serious apprehension among U.S. allies, and the policy was later abandoned in favor of a continuation of previous efforts to "contain" Communism. In negotiations with the U.S.S.R. on the future of Germany, Dulles consistently maintained a policy of insistence on reunification as a prerequisite to a peace treaty. In 1954 he negotiated a treaty with Nationalist China for the defense of Formosa (*q.v.*) and the Pescadores Islands. In the Hungarian uprising of 1956 he maintained a policy of noninterference. Dulles won a reputation as the most widely traveled Secretary of State in U.S. history, visiting 46 countries and flying 560,000 m. In 1956 he underwent an operation for cancer; two years later the disease recurred, and on April 17, 1959, he resigned.

Dulong (*dū-lōn*), PIERRE LOUIS, physicist and chemist, born in Rouen, France, Feb. 12 (?),



JOHN FOSTER DULLES

1785; died in Paris, July 18 (?), 1838. An assistant to Comte Berthollet, he became professor of physics at the Ecole Polytechnique in Paris in 1820, and director in 1830. He discovered nitrogen chloride (1811) and lost an eye and several fingers while investigating its properties. He is best known for his work in collaboration with Alexis T. Petit on the specific heats of atoms, resulting in the empirical law of Dulong and Petit (1819) on the constancy of atomic heats: The atomic heats of all elements in the solid state are nearly the same. The atomic heat is the product of the specific heat and the atomic weight of an element. The quantity of heat required to raise one atomic weight of an element through 1 degree C. is, on an average, 6.15 calories. There are many exceptions to this rule, and the Nernst-Thompson rule later amplified the Dulong-Petit law. Contemporary with J. J. Berzelius (*q.v.*), Dulong also determined the quantity of water formed when hydrogen is passed over glowing copper oxide, which was one of the earliest atomic-weight determinations. Berzelius often used the empirical law of Dulong and Petit to check the atomic weights of elements when he had determined them experimentally.

Duluth (*dū-lōōth'*), a city in Minnesota, seat of St. Louis County, at the west end of Lake Superior, 153 m. n.e. of St. Paul, Minn. It is served by the Great Northern, Northern Pacific, Soo Line, Duluth, Winnipeg & Pacific, Chicago & North Western, and other railroads. The Williamson-Johnson municipal airport is 7 m. to the northwest.

Duluth's location on the shore of Lake Superior is important both economically and recreationally. The city, with an area of 62.3 sq. m., lies from 602 ft. to 1,400 ft. above sea level. It is laid out along the waterfront for 30 m., with avenues leading northwest to the hills,

where the residential sections are located. The Duluth-Superior Harbor has an area of 19 sq. m. and is protected by a 9-m. strip of land (Minnesota Point) which forms a natural breakwater and is cut by ship canals. The largest of these canals is crossed by a 510-ft. aerial-lift bridge (built in 1905, replaced in 1930), first of its kind in the U.S. Duluth is linked with Superior, Wis., by four bridges (two railroad, one vehicular, and one combination).

Located on the St. Lawrence Seaway, Duluth is a major shipping and commercial center. The Duluth-Superior Harbor is the second-largest port in the U.S. in annual tonnage, which consists principally of iron ore from the surrounding mining region and grain from the "bread-basket of the nation," the territory within a 500-m. radius of the city. Its manufactures include foods, iron and steel products, leather, chemical products, machinery, and electrical and transportation equipment. There are also grain elevators and railroad-repair shops. The city is part of a standard metropolitan statistical area (pop., 1960, 276,596) comprising Douglas County in Wisconsin and St. Louis County in Minnesota. The city had a value added by manufacture of \$75,264,000 in 1958.

Duluth has ca. 40 public elementary and secondary schools, which enroll ca. 20,000 pupils annually; parochial schools enroll an additional ca. 3,900 pupils. Institutions of higher learning include the Duluth branch of the Univ. of Minnesota, St. Scholastica Coll., and two business colleges. Cultural facilities include the St. Louis County Historical Society, Tweed Gallery of the Univ. of Minnesota, Darling Observatory, and the Children's Museum and Art Center. The

Duluth Symphony Orchestra is well known.

Duluth had a commission form of government from 1913 to 1956, when the mayor-council form was adopted, providing for a council of nine members who, with the mayor, serve four-year terms.

The city was named for Daniel Greysolon, Sieur Duluth (or Dulhut), a French explorer who held an Indian council on the site in 1679. Duluth was platted in 1856 and incorporated as a city in 1870, the year the first railroad reached it. A new charter was obtained in 1887.

The population of Duluth from 1880 to 1900 showed a remarkable increase, rising from 3,843 to 52,969. In 1940 the population had reached 101,065; in 1950 it was 104,511 and in 1960, 106,884.

Duma (*dōō'mä*) or DOUMA, the lower branch of the legislative department of Czarist Russia, established by an imperial manifesto on Oct. 19, 1905, and frequently referred to as the National Assembly. This concession to a democratic form of government was granted by the czar after the unsuccessful revolution of 1905. It stilled the demand for representation without putting any power in the hands of the people, as approximately 200,000 landowners had greater representation than 90,000,000 middle-class, working, and farm voters.

Frequently dissolved, the Duma was limited in power by the czar, who retained veto power over its legislation. It was abolished during the revolution of 1917.

Dumas (*dōō-mä'*), ALEXANDRE, novelist, born in Villers-Cotterets, France, July 24, 1802; died at his son's home in Puys, near Dieppe, Dec. 5, 1870. Dumas was brought up in a

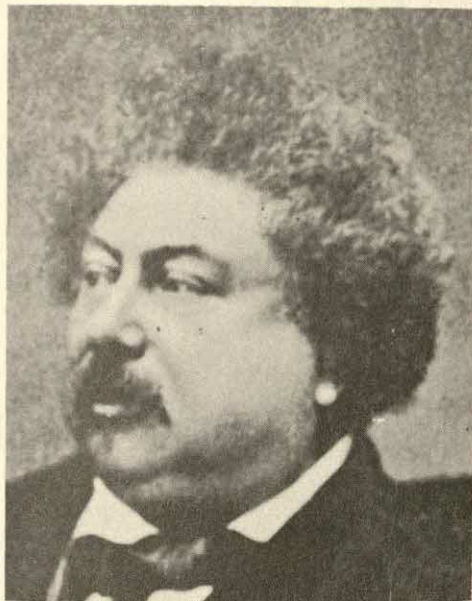
AERIAL LIFT BRIDGE AT DULUTH, MINN.

Night view of the bridge across a ship canal on Minnesota Point, taken from the Skyline Drive overlooking the city. In the foreground is the retail and banking district

Courtesy Duluth Chamber of Commerce, Minn.



French country town, and at the age of 21 proceeded to Paris to seek his fortune. Almost reduced to poverty, he ultimately secured a clerkship and later began to write plays. His "Henry III" soon became popular in Paris and gained a



Courtesy Brown Bros., N. Y.

ALEXANDRE DUMAS, PÈRE

reputation. Entering upon a tour of Switzerland, he contributed reports of the journey to a magazine, by means of which he became well known, and subsequently his "The Count of Monte Cristo" made his acquaintance world wide. Soon after he published "Three Musketeers," which proved no less popular than "The Count of Monte Cristo," the two arousing interest equal to "Robinson Crusoe" and Scott's "Waverley." Later he undertook story writing, for which purpose he employed assistants and published several works as his own productions. His life was characterized by various extensive schemes, one of which was joining the army under Garibaldi in 1860, through which he lost his fortune and became penniless. During his prosperity he made more than \$50,000 a year by writing, but at the time of his death he had scarcely greater means than when he started on his work in Paris as a young man. Among his general writings are: "The Black Tulip," "Twenty Years After," and "Margaret of Anjou."

Dumas, ALEXANDRE, novelist, son of Alexandre Davy Dumas, born in Paris, France, July 28, 1824; died Nov. 27, 1895. He was educated at the Collège Bourbon, receiving much assistance for his literary work from his father. His early life

was spent largely in company with actors and literary people, through whom he acquired an interest in literature, and his work of writing poetry and sketches began at an early age. He published his first book in 1840 and produced a popular drama four years later. Publishing several successful comedies, he was installed as a member of the French Acad. in 1875, and was made grand officer of the Legion of Honor in 1894. Among his best known writings are: "La



Courtesy Metropolitan Museum of Art, N. Y.

ALEXANDRE DUMAS, FILS

Traviata," "Le Fils Naturel," "Franchillon," and "Monsieur Alphonse."

Du Maurier (*dü mô-ryä'*), GEORGE LOUIS PARMELLA BUSSON, caricaturist and author, born in Paris, France, Mar. 6, 1834; died in London, Oct. 8, 1896. He was liberally educated, studying chiefly in Paris, and adopted art as a profession. His first employment was that of illustrating sketches for several London periodicals. He later became a member of the staff of *Punch*. He published a series of essays on his art in *Punch* in 1890, and prepared illustrations for Thackeray's "Henry Esmond" and Jerrold's "The Story of a Feather." As a writer his fame was made in 1891 by "Peter Ibbetson," followed in 1894 by "Trilby." The latter appeared as a serial in *Harper's Magazine*, but its height of popularity was not reached in America until it appeared in book form. Soon after, it was dramatized and played with considerable success on the stage in many important cities. In 1896 "The Martian" and numerous contributions to *Punch* were published. His finest productions in art are the illustrations of Thackeray's works, and his most popular writing is "Trilby."

Du Maurier (*dü mô-ryä'*), DAPHNE, author, born in London, 1907, descendant of a famous



DAPHNE DU MAURIER

writing family, daughter of the actor, Sir Gerald Du Maurier. She was educated in Paris. Her novels include: "The Loving Spirit" (1931), "Jamaica Inn" (1936), "Rebecca" (1938), "Come Wind—Come Weather" (1941), "Frenchman's Creek" (1942), "Hungry Hill" (1943), and "The King's General" (1946). She has also written biographies of her family, "The Du Mauriers" (1937), and of her father, "Gerald, a Portrait" (1934), and also a play, "Years Between" (1945).

Dumbarton (dŭm-bär'tŭn), a seaport and the capital of Dumbartonshire, Scotland, 13 m. n.w. of Glasgow. It is situated on the Leven River, near its entrance into the Clyde. The castle of Dumbarton, located at the mouth of the Leven, stands on a basaltic rock which rises about 560 ft. Sir William Wallace, the Scotch hero, was for a time imprisoned in the castle. It was a residence of Mary, Queen of Scots, before she went to France. Dumbarton is a trade center and has extensive shipyards, iron foundries, cordage works, and machine shops. Population, ca. 17,500.

Dumbarton Oaks, an estate in Washington, D.C.; synonymous with the United Nations Post-war Security and World Security Conference held there in 1944. See *San Francisco*; *United Nations*.

Dumfries (dŭm-frēs'), a river port and the capital of Dumfriesshire, Scotland, 72 m. s.w. of Edinburgh. It is situated on the Nith River and has convenient railroad facilities. Manufacturing includes hosiery, baskets, clothing, leather, and shoes. Dumfries is noted for its early history. In 1306 Robert the Bruce slew the Red Comyn in the Greyfriars' Monastery, which was built by Devorgilla, the mother of John Baliol. Robert Burns, the poet, is buried in St. Michael's churchyard. The Young Pretender made Dumfries his headquarters in 1745. Population, 1930, 18,145.

Dumouriez (dŭ-mōō-ryā'), CHARLES FRANÇOIS, general, born in Cambrai, France, Jan. 25, 1739; died Mar. 14, 1823. Descended from a re-

DUNANT

spectable family, he secured a good education and attached himself to the army, serving with distinction during the Seven Years' War. In 1768 he became quartermaster general of a small army in Corsica, with which the conquest of that island was undertaken, and afterward was made a colonel for faithful service. He was appointed governor of Cherbourg in 1778, and, when the Revolution broke out, he joined the popular party, becoming minister of foreign affairs in 1792. At the beginning of the war between France and Austria he took a command in the army, succeeded in an invasion of Flanders, and conquered Belgium. His loyalty to the revolutionary government was mistrusted, and soon after he became allied with the party favoring a constitutional monarchy, and he was compelled to flee when attacked by the Versailles volunteers on Mar. 4, 1793. A price was set upon his head by the convention, but he escaped by giving himself up to the Austrian government, and later settled as an exile in England. He published his "Memoirs" in 1794, which he wrote himself, and published an enlarged edition in 1822. Dumouriez remained in exile until the time of his death.

Dumping (dŭmp'ing), in commerce, a term signifying the flooding of the market with goods for sale at a low price, either to dispose of excess or to eliminate competition. Dumping is a practice most often used by over-industrialized nations to relieve their excess supply, or by nations lacking sufficient gold to provide for payments of raw materials necessarily bought from other countries.

Dun (dŭn), ROBERT GRAHAM, commercial expert, born in Chillicothe, O., 1826; died in 1900. He entered a mercantile agency in New York City at the age of 24, and speedily rose to the presidency. In 1859 he formed his own agency, R.G. Dun & Co., which was merged with Bradstreet Co. (1933), to form Dun & Bradstreet, Inc. In 1893 he began publication of a weekly business report, *Dun's Review*.

Dŭna (dŭ'nā), a river of Western Russia. See *Dvina*.

Dŭnaburg (dŭ'nā-boōrk), a city of Latvia in the government of Vitebsk. See *Dvinsk*.

Dunant (dŭ-nān'), JEAN HENRI, author, born at Geneva, Switzerland, in 1828; died in 1910. Famous as the founder of the International Red Cross. Resolved, at the battlefield of Solferino, in the Crimean War, to bring about organized aid to the victims of war, he devoted his life to writing and lecturing on care for the wounded. The Geneva Convention, an international treaty covering the treatment of war prisoners and wounded, drawn up in 1864, was largely the result of his efforts. A permanent international committee was established the same year with a nucleus of 10 governments as the first Red Cross members.

Dunant, who devoted his entire fortune to charity, was awarded the Nobel Peace Prize in 1901, jointly with Frederic Passy.

Dunbar (*dūn'bar*), PAUL LAURENCE, Negro poet, born at Dayton, O., in 1872; died Feb. 9, 1906. He was graduated from the high school in Dayton and for a time worked on newspapers in New York City. In the meantime he began to write poems and appeared successfully as a public reader. W.D. Howells and others commended his writings for the genius displayed in the dialect and the humor characteristic of negro life. His writings include: "Lyrics of Lowly Life," "Oak and Ivy Poems," "Lyrics of Love and Laughter," "Heart of Happy Hollows," "Lyrics of Sunshine and Shadow," and "Poems of Cabin and Field."

Dunbar, WILLIAM, Scottish poet, born at Salton, Scotland, about 1460; died about 1520. He joined the Order of Franciscans and traveled as a friar and itinerant preacher in his youth. In 1500 he was employed as clerk of embassy by James IV of Scotland. He possessed a variety of poetic gifts and many regard him as the greatest of the Scottish poets. His writings include: "The Thistle and the Rose," written in honor of the marriage of James IV to Margaret of England, "The Dance of the Seven Deadly Sins," and "The Two Married Women and the Widow."

Duncan (*dūng'kan*), ISADORA, dancer, born in San Francisco, Cal., 1880; died in 1927. Acclaimed first in New York, where she revived the Grecian

mode of dancing, then in London, Paris, Vienna, and Budapest, she founded a dancing school for children at Berlin, Germany (1904). Though she lived most of her life in Paris, she went to Moscow (1921), where she established a second school.

She was noted for her interpretive dances, in which she characterized music through movements. Her autobiography, "My Life" (1927), recounts her tragic personal story. She died as the result of an automobile accident at Nice, France, Sept. 4, 1927.



Courtesy Columbia Concerts, N. Y.

ROBERT TODD DUNCAN

Duncan, ROBERT TODD, singer, actor, and teacher, born in Danville, Ky., Feb. 12, 1903. His mother gave him his first music lessons when he was five, and by the time he had been graduated from Butler Univ., Indianapolis, Ind. (1925), he was giving music lessons in a local high school. In the following year he became an instructor of music and English at the Municipal Coll. for Negroes, Louisville, Ky. After receiving his master's degree from Columbia Univ. in 1930, he began teaching at Howard Univ., Washington, D.C. In charge of public school music and professor of voice at Howard since 1931, he has gone on leave several times for the stage performances which have made him famous. In 1934 he performed in an all-Negro production of "Cavalleria Rusticana," and as a result of his success was given the role a year later of Porgy in George Gershwin's folk opera, "Porgy and Bess." After completing a West Coast production of "Porgy and Bess" in 1938, Duncan spent a year in England giving concerts and acting in "The Sun Never Sets." A Scandinavian tour was canceled because of the war, and he returned to his post at Howard. In 1940 Duncan appeared in "Cabin



Courtesy Museum of Modern Art, N. Y.

ISADORA DUNCAN



Courtesy Mass. Development & Industrial Com.

SAND DUNES AT CAPE COD

The coarse short grass and stubby plateaus of these sand dunes at West Barnstable, Cape Cod, Mass., are characteristic of sand dunes throughout the world. The grass (sedge or crab grass) is sometimes planted to hold down the sand

in the Sky" and two years later in a revival of "Porgy and Bess."

Dundee (*dūn-dē'*), the third city of Scotland, in Forfarshire, 50 m. N.E. of Edinburgh. It is situated on the Firth of Tay, about 10 m. from its entrance to the sea, and is the center of a large railroad and navigation commerce. The town has a safe harbor and extensive dockyards. Among the manufactures are textile goods, clothing, confectionery, earthenware, and machinery. It is the seat of extensive warehouses, flour mills, and machine shops. The northern seal and whale fishery interests make it an important center of operation, thus adding largely to its commercial importance. Among the noteworthy buildings are St. Paul's Episcopal Church, the post office, the county courthouse, Kinnaird hall, and Univ. College. The Firth farther up is spanned by a bridge 3,600 yds. long. Dundee was besieged and sacked by the Duke of Montrose in 1645, and was stormed by Gen. Monk about six years afterward. Its history in connection with Great Britain is quite interesting. Population, 1921, 165,006; in 1940, about 179,000.

Dune (*dūn*), a name first given to the hills of sand along the coast which are blown together by the winds, but later applied to sandhills formed similarly in regions of sandy or arid soil.

Dunes begin to form where the sand is blown against some obstruction, such as a log or boulder, and from this beginning low hills are built up gradually. They are common on the sandy Atlantic coast of North America from Cape Cod to Cape Canaveral, where they are frequently from 10 to 30 ft. high, and on the coasts of the Bahamas they reach heights of more than 100 ft. In France, in the department of Landes, the dunes cover a large area and encroach farther upon the land each year. Others are found among the cliffs of England, near the southern end of Lake Michigan, and in extensive areas of the Sahara.

Dunedin (*dūn-ē'dīn*), a city of New Zealand, capital of the provincial district of Otago, on the E. side of South Island. It is conveniently located at the head of Otago harbor, and has a large interior and domestic trade. A railway connects it with the principal cities of the island, and steamboats run regularly between it and Melbourne. It is the seat of Otago Univ., opened in 1871. Among the manufactures are clothing, brick, pottery, utensils, and woolen goods. The first settlement on its site was made in 1848, but its prosperity dates from 1861, when extensive gold fields were discovered in the vicinity. Population, ca. 65,000.

Dunfermline (*dūn-fēr'm'līn*), a city of Scot-

DUNG-BEETLE

land, in the western part of Fifeshire, 16 m. N.W. of Edinburgh. There are lime beds and coal mines near by. Manufactures include cotton and linen goods, clothing, iron products, and machinery. Dunfermline is the birthplace of David II and Charles I. Robert Bruce and other rulers are buried in the Abbey Church. Population, 1951, 44,710.

Dung-Beetle (*dũng-bě'tl*), the name for several beetles which roll the dung of horses and cattle into pellets, in which they nest and lay their eggs. A Mediterranean kind, the *scarabeus* (*q.v.*), was held sacred in ancient Egypt.

Dunkards (*dũng'kěrdz*) or **DUNKERS**, a name derived from the German word *Tunkers*, meaning immersers; it is the name of a Protestant denomination, also known as the German Baptist Brethren. The original society was founded at Schwarzenau, Germany, in 1708; later the sect was persecuted and under Peter Becker migrated to Germantown (now part of Philadelphia, Pa.) in 1719. Its modern subgroups are known as Conservative, Old Order, Progressive, and (German) Seventh-Day Baptists. The entire Dunkard denomination comprises ca. 200,000 members; most of its members are in Ohio, Pennsylvania, and Indiana. The Dunkards observe strict rules of dress and behavior, rejecting any customs not authorized by the Bible, such as dancing, frivolous dress, and the use of intoxicants. Members are immersed thrice upon admittance to the church. They publish their own literature and maintain several colleges and seminaries. The Conservatives, the largest group, are also known as the Church of the Brethren.

Dunkirk (*dũn'kěrk*), a city and port of entry in Chautauqua County, New York, on Lake Erie, about 35 m. S.W. of Buffalo. A major shipping center for the surrounding grape-growing region, it is served by the New York Central, the Erie, and other R.R.'s. Manufactures include glass, machinery, locomotives, clothing, and tool steel. Dunkirk was settled about 1809 and incorporated in 1837. Population, 1950, 18,007.

Dunkirk or **DUNKERQUE**, a seaport in France, on the Strait of Dover, in the department of Le Nord, 28 m. N.E. of Dover. The harbor is large and convenient. Shipbuilding and cod and herring fishing are important industries. Among the manufactures are sugar, liquors, cordage, leather goods, soap, and machinery. Dunkirk owes its early growth to a chapel founded by St. Éloi in the 7th century. Long a fortified town, it has been attacked in many wars. England held it from 1658 to 1662, when Charles II sold it to Louis XIV. The Germans bombarded it heavily in 1914 and 1915. In World War II (*q.v.*), during the Battle of France, 215,000 British and 120,000 French troops were evacuated from Dunkirk to England (May 28-June 4, 1940).



Courtesy British Information Services, N. Y.

EVACUATION AT DUNKIRK, 1940

The city was occupied by the Germans from 1940 to 1945. In March 1947 France and Great Britain signed a 50-year treaty for political and economic cooperation at Dunkirk. Population, 1946, 10,575.

Dunlap (*dũn'lăp*), **WILLIAM**, playwright, theater manager, artist, historian, born in Perth Amboy, N.J., Feb. 19, 1766; died in New York City, Sept. 28, 1839. His formal education was interrupted by a boyhood accident which cost him one eye, and he thereupon took up drawing and painting; his portrait subjects included George and Martha Washington. He studied (1784-89) painting in London under Benjamin West (*q.v.*) but grew more interested in the theater. His comedy, "The Father," was produced (1789) with some success in New York City. In 1796 he bought an interest in a theater and produced his own plays including "André" (1798), and many translations. Later in life he returned to painting and writing, without great financial success. Besides his plays, his best-known work is a "History of the American Theater" (1832).

Dunmore (*dũn-môr'*), a borough of Lackawanna County, Pennsylvania, on the Erie and the Lackawanna R.R.'s. It is a residential suburb of Scranton, which it adjoins. Its manufactures include shoes, gloves, and silk, rayon, and nylon goods. The place was settled in 1783 and incorporated in 1862. Population, 1950, 20,305.

Dunmore, **JOHN MURRAY**, 4TH EARL OF, royal

governor of New York and Virginia, born in England in 1732; died there in 1809. Descended from the Stuarts, he succeeded to the peerage in 1756 and became governor of New York in 1770 and of Virginia in 1771. His measures to suppress colonial demonstrations against British policy helped to incite armed rebellion in Virginia. Forced to flee in 1775, he conducted petty warfare against the colonists until he returned home in 1776. He was governor of the Bahamas, 1787-96.

Dunne (*dŭn*), FINLEY, PETER, journalist and humorist, born in Chicago, Ill., July 10, 1867; died in New York, N.Y., April 24, 1936. After finishing elementary school in Chicago, he began a distinguished career as a newspaper man, which included the editorship of the *Chicago Journal* (1897-1900). While working on the *Chicago Evening Post* (1892-97), he attracted attention by publishing witty sketches on the philosophy and thinking of *Martin Dooley*, saloonkeeper of Archey Road. His treatment of news items (particularly on the Spanish-American War)—in Irish dialect and in the form of monologues—analyzing the faults and criticizing the foibles of his contemporaries made him a national figure. Among his books were "Mr. Dooley in the Hearts of His Countrymen" and "Mr. Dooley in Peace and War" (1898), "Mr. Dooley's Philosophy" (1900), and "Mr. Dooley on Making a Will and Other Necessary Evils" (1919).

Dunsany (*dŭn-sā'ni*), EDWARD JOHN MORETON DRAX PLUNKETT, 18TH BARON, poet, dramatist, novelist, born in London, England, July 24, 1878; died in Dublin, Ireland, Oct. 25, 1957. He was educated at Sandhurst Coll. and served in the Boer War and World War I. Lord Dunsany held a professorship in English literature at Athens Univ., 1940-41.

He was a prolific writer, publishing over 50 books, including poems: "Fifty Poems" (1929) and "To Awaken Pegasus" (1949); and prose works: "The Gods of Pegana" (1905), "Patches of Sunlight" (1938), an autobiography, and "The Man Who Ate the Phoenix" (1949). As a dramatist, he won acclaim for "The Glittering Gate" (1908), "The Gods of the Mountain" (1911), and "A Night at an Inn" (1916).

Duns Scotus (*dŭnz skŏ'tŭs*), JOHN, one of the leading medieval theologians and philosophers, born between 1265 and 1275; died Nov. 8, 1308. The place of his birth is variously reported as Berwickshire, Ulster, or Northumberland. He became a friar of the Franciscan order and studied at Merton Coll., Oxford, where he later became a professor of philosophy. Although his reputation in his time was based essentially on his position in reference to some theological questions, his importance to us lies in his philosophical theories. As Thomas Aquinas, the Dominican, was the founder of a philosophical school of



Courtesy Bettmann Archive, N. Y.

JOHN DUNS SCOTUS

thought which we call Thomism, so the Franciscan, Duns Scotus, was the founder of Scotism. Duns believed in the actual reality of existing subjects to which our human conception corresponds; thus, his concept was that of complete realism. All knowledge, even all ethical principles, are empirical, or based on experience.

His main argument with Thomas Aquinas was in defense of the doctrine of the Immaculate Conception (*q.v.*), which became a dogma of the Catholic Church in the 19th century. In this connection, the subtle dialectics of Duns Scotus earned him the title of "Doctor Subtilis."

In contrast to Aquinas, Duns Scotus asserted that the existence of God cannot be proved and, further, that man can know nothing of His nature. He also believed that revelation represents the ultimate reason and also the ultimate will, whereas Aquinas held that reason could influence the will.

The controversies between Thomists and Scotists continued throughout the scholastic period into modern times and even into the contemporary period. The principal work of Duns Scotus was his "Opus Oxiense," or "Opus Anglicanum," consisting of questions and commentaries on Aristotle and Peter Lombard.

Dunstan (*dŭn'stan*), SAINT, Archbishop of Canterbury, born in Glastonbury, England, in 925 A.D.; died May 19, 988. Of noble birth, most of his early history is uncertain, though it is known that he had musical talent. He appears to have worked with considerable skill as a jew-



EUROPEAN FOLK COSTUMES

1. Norwegian 2. Swedish 3. Italian 4. Spanish



SLAVIC FOLK COSTUMES

1. Slovakian 2. Carpatho-Russian 3. Pusterthal-Hungarian 4. Polish 5. Hungarian
6. Polish 7. Hungarian

cler, blacksmith, and calligrapher. Being greatly annoyed by evil temptations, he thrust his tongs into the fire, and, when they were white-hot, seized the fiend by the nose and caused his clamor of agony to resound through the entire neighborhood. After being educated at the abbey of his native town, he became a monk and was shown much favor by King Edmund.

When Edwy succeeded to the throne, in 955, Dunstan lost public favor, but he regained it when Edgar became the ruler of the country north of the Thames. The latter became king of the whole country after the death of Edwy and made Dunstan Archbishop of Canterbury. Having a potent influence over King Edgar, his reign became known as the most peaceful, prosperous, and successful in early English history. Due to St. Dunstan's influence, the Danes and English united under one dominion and the clergy was improved. King Edgar supported his ambitions to extend celibacy among the clergy by establishing and maintaining the strict rule of Benedictine monasteries. With the death of Edgar the influence and credit of the monk rapidly declined and his life was ended in obscurity.

Duodenum (*dū-ō-dē'nūm*), in anatomy, the first part of the small intestine (*q.v.*) which begins at the pylorus. It is about 8 to 10 in. long or 12 finger-breadths. The openings of the pancreatic duct and of the common bile-ducts fit into the duodenum.

Dupleix (*dū-plēks'*), MARQUIS JOSEPH FRANÇOIS, colonial administrator, born in Landrecies, France, Jan. 1, 1697; died in Paris, Nov. 10, 1764. The son of a director of the French East India Co., he became administrator (1730) and governor general (1742) of French establishments in India. His tenure encompassed the struggle with the British that ended French hopes of an Indian empire. Recalled in 1754, he died in relative poverty, having expended his personal fortune in efforts to further French interests.

Du Pont (*dū-pōnt'*), name of a prominent family of industrialists. The two American branches descended from PIERRE SAMUEL DU PONT DE NEMOURS, economist and statesman, born in Paris, France, Sept. 14, 1739; died near Wilmington, Del., Aug. 6, 1817. He was a follower of François Quesnay (*q.v.*) and a leading member of his Physiocratic school of economics. An opponent of the French Revolution, he was imprisoned (1792) for his reactionary views and in 1799 emigrated to the U.S. From 1802 to 1815 he was again in France, returning to the U.S. in the latter year. His two sons, Victor Marie and Éleuthère Irénée, founded the American branches of the family.

VICTOR MARIE DU PONT was born in Paris, Oct. 1, 1767; died in Philadelphia, Pa., Jan. 30, 1827. Becoming a member of the French diplomatic



Courtesy Brown Bros., N. Y.

ÉLEUTHÈRE IRÉNÉE DU PONT

corps, he served in the first legation in the U.S. from 1787 to 1796, except for the years 1789-91, when he was aide-de-camp to the Marquis de Lafayette. Settling in the U.S. in 1800, he entered several business enterprises and later was manager of his brother Irénée's woolen mills near Wilmington, all with little success. He was a director of the Bank of the U.S. and later a member of the Delaware legislature. His son, SAMUEL FRANCIS, naval officer, was born in Bergen Point, N.J., Sept. 27, 1803; died in Philadelphia, Pa., June 23, 1865. He served in the Mexican War (1846-47) and was a member (1850) of the board that drew up plans for the naval academy at Annapolis. He served conspicuously during the Civil War, commanding the squadron that captured Port Royal, S.C. (1861), and later leading blockading actions along the southern coast. He retired with the rank of rear admiral.

ÉLEUTHÈRE IRÉNÉE DU PONT, founder of E. I. du Pont de Nemours & Co., was born in Paris, June 24, 1771; died in Philadelphia, Pa., Oct. 31, 1834. After working in his father's printing plant in Paris (1791-97), he emigrated with him to the U.S. in 1799 and established a gunpowder plant near Wilmington, Del., in 1802. As supplier to the U.S. government, particularly during the War of 1812, the company prospered enormously, beginning its rise to its 20th-century position as one of the nation's great industrial empires. Succeeding Éleuthère Irénée in the presidency were his sons ALFRED VICTOR (1798-1856) and HENRY,

born near Wilmington, Del., Aug. 8, 1812; died Aug. 8, 1889. A graduate (1833) of the Military Acad. at West Point, Henry resigned his commission in 1834 to enter the family firm. With Alfred Victor, he became head of the company in 1850 and was responsible for important expansion of its interests. Four great grandsons of Éleuthère Irénée succeeded to the presidency of the company: THOMAS COLEMAN was born in Louisville, Ky., Dec. 11, 1863; died Nov. 11, 1930. A coal-mining executive in Kentucky from 1883, he joined the firm at Wilmington in 1900 and became president in 1902, serving until 1915. He was U.S. Senator from Delaware (1921-28). PIERRE SAMUEL was born in Wilmington, Del., Jan. 15, 1870; died there, April 5, 1954. He joined the company as a chemist in 1890, and under his leadership as president, 1915-19, and chairman of the board, 1919-40, it branched out into the manufacture of fabrics, motion-picture film, and paints and varnishes. In 1920 he reorganized General Motors Corp. and was its president for three years. IRÉNÉE was born in Wilmington, Del., Dec. 21, 1876. He headed du Pont as president (1919-26) and later served as member and vice chairman of the board. LAMMOT was born in Wilmington, Del., Oct. 12, 1880; died in New London, Conn., July 24, 1952. He joined the company in 1902 and served as president (1926-40), chairman of the board (1940-48), and honorary chairman from 1954.

HENRY ALGERNON DU PONT, son of Henry, army officer and member of the family firm, was born near Wilmington, Del., July 30, 1838; died Dec. 31, 1926. A graduate of the Military Acad. at West Point, he served through the Civil War, received the Congressional Medal of Honor (1864), and resigned in 1875. He was a member of the firm (1878-1902), a railroad executive, and a U.S. Senator (1906-17).

Düppel (*düp'el*), (German for DYBBOL), a town in southern Jutland, Denmark, ca. 6 m. s.w. of Sønderborg. In 1848 and 1849 the Danes defeated allied German troops there. In 1864 the Prussians captured the town. Düppel reverted to Denmark in 1920. Population, ca. 1,000. See also *Schleswig-Holstein*.

Dupré (*dü-prä'*), JULES, painter, born in Nantes, France, April 5, 1812; died in L'Isle-Adam, Oct. 6, 1889. Originally a porcelain painter, he turned to landscapes and became noted as a member of the Barbizon school. His works include "The Sluice," "The Return of the Flock," "The Landscape," "The Interior of a Courtyard," and "The Valley of Montmorency."

Durand (*dü-ränd'*), ASHER BROWN, engraver and artist, born in Jefferson, N.J., Aug. 21, 1796; died there, Sept. 17, 1886. After apprenticeship to an engraver, he achieved wide renown for his reproduction (1823) of John Trumbull's "The

Signing of the Declaration of Independence." In 1836 Durand turned to painting, becoming known as a founder of the Hudson River school of landscape artists. A charter member of the National Acad. of Design, he was its president in 1845-61. His works include "The Capture of André," "The Wrath of Peter Stuyvesant," "The Trysting Tree," and "Harvey Birch and Washington."

Durango (*dōo-räng'gō*), officially VICTORIA DE DURANGO, a city in northern Mexico, 500 m. N.W. of Mexico City. A rail and industrial center, it has iron, steel, textile, and flour mills and manufactures glass, leather, sugar, and tobacco products. Founded in 1564, the city was important in the early history of northern Mexico. Population, 1960, 59,407.

Durango (*dōo-räng'gō*), a city in southwestern Colorado, seat of La Plata County, on the Animas River, 175 m. N.E. of Albuquerque, N.M. It has freight service on the Denver and Rio Grande R.R.; La Plata Field is 16 m. to the southeast. Mesa Verde National Park is to the west, and the city is surrounded by national forests and Indian reservations. Durango's principal industrial products are lumber, oil, gas, and vanadium. The surrounding farming area also has deposits of lead, copper, and zinc. The site was settled in 1885. Population, 1950, 7,459; in 1960, 10,530.

Durant (*dū-rant'*), a city in southeastern Oklahoma, seat of Bryan County, 160 m. S.E. of Oklahoma City. It is served by the Missouri-Kansas-Texas, St. Louis-San Francisco, and Kansas, Oklahoma and Gulf railroads. Eaker Field is 3.5 m. to the south. A business and commercial center, Durant is a market for the surrounding farm area, which produces beef cattle, swine, dairy products, Spanish peanuts, and cotton. Oil is produced nearby. The city is within easy reach of the resort area of Lake Texoma, to the west, on which are located Tishomingo Wildlife Reserve and Hagerman Wildlife Refuge. The site was settled in 1832, and Durant was incorporated in 1898. Population, 1950, 10,541; in 1960, 10,467.

Durant, WILL(IAM JAMES), philosopher, author, born in North Adams, Mass., Nov. 5, 1885. A graduate (1907) of St. Peter's Coll., N.J., he was professor of Latin and French at Seton Hall Coll. (1907-11) and director of the Labor Temple School in New York City (1914-27). He became professor of philosophy at the Univ. of California at Los Angeles in 1935. Among the best known of his many philosophical discourses and books on world affairs are "Philosophy and the Social Problem" (1917), "The Story of Philosophy" (1926), "Adventures in Genius" (1931), "On the Meaning of Life" (1932), and the multivolume series collectively titled "The Story of Civilization,"



WILL DURANT

comprising "Our Oriental Heritage" (1935), "The Life of Greece" (1939), "Caesar and Christ" (1944), "The Age of Faith" (1950), "The Renaissance" (1953), "The Reformation" (1957), and "The Age of Reason Begins" (1961).

Duranty (*dū-răn'ti*), **WALTER**, journalist, born in Liverpool, England, May 25, 1884; died in Orlando, Fla., Oct. 3, 1957. Duranty worked for the New York *Times* in 1913-39, notably as Moscow correspondent (1921-35). He won a Pulitzer Prize for reporting (1932) and an O. Henry Prize (1928) for his short story "The Parrot." He also wrote a number of books on Russia, e.g., "U.S.S.R.: The Story of Soviet Russia" (1944) and "Stalin & Co." (1949).

Durban (*dūr'bən*), a major seaport of South Africa. The domestic and export trade are important. It has manufactures of clothing, bricks, utensils, and machinery. Durban was founded in 1823 by the Dutch. Population, 1951, 479,974.

Dürer (*dü'rër*), **ALBRECHT**, painter and engraver, born in Nuremberg, Germany, May 21, 1471; died Apr. 6, 1528. He was the son of a pious goldsmith, received a good education, and was instructed in the goldsmith trade. At the age of 15, he became apprenticed to Michael Wohlgemut, then well known for his paintings and woodcuts. Soon after he spent four years traveling in Germany and the Venetian states, studying the arts and industries. Although Dürer was deeply impressed by Italy as a country, by its civilization, and mostly by the works of his Italian contemporaries, the direct influence of Italian art upon his work is not too great. His color scheme and the principles of his composition obviously changed after his sojourn in Italy, but he did not imitate the foreign masters. The intrinsic character of his work was too German for that.

Woodcuts, drawings, and especially his landscape water colors, testify to Dürer's mastery, but



ALBRECHT DÜRER

A silver pencil drawing, this self-portrait was executed by Dürer at the age of thirteen

he is still the typical German artist combining the trends of the dying Gothic forms with very strong Renaissance tendencies. A second tour to Italy, however, including a visit to Venice (1505), influenced some of his future works. The "Feast of the Rose Garlands," preserved in the Strahow monastery near Prague, shows a strong Venetian influence in its brilliant colors. His "Adam and Eve" in the Prado museum, Madrid, shows greater looseness of form, typically representative of the Renaissance in the North. Dürer was frequently commissioned by Emperor Maximilian I; he also made various portraits for him as well as the designs for his prayer book and a great triumphal arch. Portraits of Erasmus and a sketchbook were the products of Dürer's trip to The Netherlands (1520).

Critics have found it difficult to say in which field Dürer's main importance lies. As a painter, he demonstrates in the expressive portraits of Hieronymus Holzschuher and Jakob Muffel, the "Paumgaertner Altarpiece," and the "Four Apostles," the excellent draftsmanship which characterizes all of his work. The same excellence of draftsmanship is documented in his drawings, copper engravings, and woodcuts. Variety of ex-



"MADONNA AND CHILD"

Painting by Albrecht Dürer

pression and power of representation are evident in his graphic works as, for instance, in his "Melancholia," "Knight, Death, and the Devil," and the great religious cycles, entitled the "Apocalypse." "Passions," two woodcuts, and a copper engraving, called "Passion," are other examples of the scope of Dürer's work. Dürer, like Leonardo da Vinci, was also highly interested in theoretical study, architecture, and the anatomy of the human body.

Durga (*dūr'gā*). See *Siva*.

Durham (*dūr'am*), a city and port of entry in north central North Carolina, seat of Durham County, 26 m. n.w. of Raleigh. It is served by the Norfolk and Western Ry. and other railroads. A tobacco center, it manufactures *ca.* 19 per cent of all U.S. cigarettes. Other industries include lumber and grain mills and the manufacture of hosiery, textiles, machinery, and pharmaceuticals. With Durham County the city forms the Durham S.M.S.A. (pop., 1960, 111,995), with a value added by manufacture in 1958 of \$205,930,000. The city's value added was \$204,491,000. Seat of Duke Univ. and North Carolina Coll. at Durham, it was settled *ca.* 1852 and incorporated in 1867. Population, 1940, 60,195; 1960, 78,302.

Durham, a city in northeastern England, seat of Durham County, on the Wear River, 13 m. s. of Newcastle upon Tyne. The site of the city almost encircles a steep, rocky eminence, on the top of which are Durham Cathedral, dating from 1093, and a castle, dating from 1072, which houses Durham Univ. (founded in 1832). The city is in a coal-mining region and manufactures iron and steel, machinery, pharmaceuticals, car-

DURYEA

pets, and leather. Population, 1961, 20,484.

Durkheim (*dūr'kēm*), ÉMILE, sociologist and philosopher, born in Les Vosges, France, April 15, 1858; died in Paris, Nov. 15, 1917. Educated at the École Normale Supérieure, he traveled in Germany and in 1887 became professor of sociology at the Univ. of Bordeaux. Five years later he became professor of sociology at the Sorbonne. He founded and edited (1896-1913) *L'Année Sociologique* and became a leader of a school of modern sociology which viewed social and moral behavior as conditioned by the group rather than the individual. His books include "The Elementary Forms of Religious Life" (translated, 1915) and "The Division of Labor in Society" (translated, 1933).

Durocher (*dūr-ō'shēr*), LEO, baseball player,



LEO DUROCHER

born in West Springfield, Mass., July 27, 1906. In 1925 a Yankee scout signed him to a contract with the Yankees' Hartford (Conn.) team. The next year he played shortstop in Atlanta and was then transferred to the Yankee home team to play in the World Series (1928-29). He subsequently played shortstop and second baseman for the Cincinnati Reds (1930-32); he was then traded to the St. Louis Cardinals (1933), where he became a star and was acknowledged the best fielding shortstop in baseball, with a good hitting average. After becoming captain of the Cardinals, he was selected for the national all-star team (1936). In 1939 he was traded to the Dodgers, to become captain and then manager of the Brooklyn team, and in 1948 he became manager of the N.Y. Giants. He retired from baseball, 1955-60, to take television assignments. In 1961 he became a coach for the Los Angeles Dodgers. He was married (1947-60) to motion picture actress and TV commentator Laraine Day (1920-).

Duryea (*dōor'yā*), CHARLES EDGAR, inventor,

born near Canton, Ill., Dec. 15, 1861; died in 1938. He designed what is said to be the first gasoline automobile that had all present-day essentials and demonstrated it in 1892 at Springfield, Mass. Subsequent Duryea cars successfully competed in the various automobile trials and races. In 1898, the Duryea Motor Wagon Co. was organized at Springfield, Mass.; it produced one car a week, which sold for \$1,000. In his latter years, Mr. Duryea was an engineering consultant in Philadelphia, Pa. See also *Automobile*.

Duse (*dōō'sā*), ELEONORA, actress, born in Vigevano, Italy, Oct. 3, 1859; died in Pittsburgh, Pa., April 21, 1924. In 1862 she began to appear on the stage and for some time earned her living as a strolling player. Her early appearances were not greatly successful, but in 1885 she was recognized at Naples as one of the leading actresses of Italy. In 1892 she made an international reputation by playing at Vienna, and the following year scored successes in New York and Boston. In 1897 she played in Paris and was considered the rival of Sarah Bernhardt (*q.v.*). Subsequently she toured the leading cities of Europe and America, playing with much success the roles of *Camille*, *Juliet*, *Fernande*, *Francesca da Rimini*, and *Paula* in "The Second Mrs. Tanqueray." She obtained success in many plays written for her by Gabriele d'Annunzio (*q.v.*).

Düsseldorf (*dūs'sel-dōrf*), a city of Germany, in the state of North Rhineland-Westphalia, at the mouth of the Düssel. The city has a large harbor on the Rhine and is one of the leading commercial and industrial centers of the Rhine



ELEONORA DUSE

Courtesy Brown Bros., N. Y.

Valley. The chief manufactures are machinery, chemicals, glass, and textiles. It is also noted as a center of art and education.

Düsseldorf was chartered as a city in 1288, and subsequently became the capital of the dukes of Berg, and the residence of the Palatinate electors. In 1814 it was annexed with the Grand Duchy of Berg to Prussia. The city was severely bombed during World War II, and about 46 per cent of its area was destroyed. Following the war it was occupied by British forces and the International Ruhr Control Commission established headquarters here. Population, 1950, 471,873.

Dussey de Barrene (*dū-sā' de bār-rēn'*), J. GREGORIUS, physiologist and neurologist, born in Brielle, The Netherlands, June 6, 1885; died June 9, 1940. He taught in Europe for 19 years before coming to the U.S. as Sterling professor of physiology at Yale Univ. in 1930. An authority on the functions of the central nervous system, he was acclaimed for his discoveries concerning the operation of the cerebral cortex and the interrelation of the same organs and muscles.

Dust Bowl (*düst bōl*). See *Dust Storms*.

Dust Storms. Periodically the climate of various parts of the world becomes unusually dry, and dried-out topsoil, denuded of vegetation, is carried by winds over great areas. These deposits are called loess. The central plains of the Mississippi Basin of the U.S., the northern plains of China, large sections of Russia, Africa, and Australia, are composed of loess deposits. Such deposits were probably laid down on a large scale following the glacial period, before vegetation became established. On a small scale, dust storms result from excessive plowing of soils in periods of drought, such as has occurred in the "Dust Bowl," the dry-farming areas of the Middle Western states.

Dutch (*dūch*), language and people of Holland, or The Netherlands. The name was originally applied to most of the Teutonic peoples, but beginning with the 17th century the people of Holland were designated as Dutch and all others of the Teutonic order as Germans.

Dutch (or NETHERLANDS) **East Indies**, islands of the East Indies formerly under the control of The Netherlands. These possessions included Java and Madura, Sumatra, Borneo, Celebes, the Molucca Archipelago, Timor Archipelago, Bali, and other small islands. During World War II, the Dutch East Indies were attacked by Japanese bombers and the islands of Java, Borneo, Sumatra, and Netherlands Timor were occupied by Japanese forces in April 1942. After the surrender of the Japanese empire (1945), the British army occupied the islands for The Netherlands government. The native population, clamoring for an independent republic, revolted and negotiations between Indonesian representatives and The

Netherlands government led to the establishment of an independent United States of Indonesia in 1949 (see *Indonesia*).

Dutch Guiana (*gê-ă'nâ*) or SURINAM. See *Guiana*.

Dutch West Indies, a geographical term for the Netherlands Antilles, an overseas territory of The Netherlands, comprising two groups of islands in the Caribbean Sea. The groups are the Netherlands Windward Islands (Curaçao, *q.v.*, Aruba, and Bonaire) and the Netherlands Leeward Islands (St. Eustatius, Saba, and the southern part of St. Maarten). Total area, 403 sq. m.; population, 1951, 169,256.

Duties (*dū'tēz*), a term which signifies taxes, but in general use is restricted to taxes levied upon imports and exports, and has much the same meaning as customs. *Ad valorem duty* is the duty levied upon imported merchandise at a given per cent, as invoiced by the importer. A *specific duty* is the duty chargeable on imported merchandise by quantity, weight, or number, without regard to value. See *Customs Duties*; *Tariff*.

Duval (*dū'vāl*), WILLIAM POPE, territorial governor of Florida, born near Richmond, Va., in 1784; died in Washington, D.C., March 19, 1854. A frontier lawyer in Kentucky, he was elected to the U.S. Congress (1813-15) and in 1821 became the first judge of the superior court of East Florida. As first civil governor of the Florida territory (1822-33), he achieved the peaceful removal of the Seminole Indians to southern Florida.

Duveen (*dū'ven*), JOSEPH, art dealer, born in Hull, England, Oct. 14, 1869; died in London, May 25, 1939. He entered and eventually became the sole proprietor of his family's firm of Duveen Brothers, dealers in art and antiques, building it into a fabulous international business. His sales of great paintings to wealthy Americans were influential in forming several notable American art collections. For his contributions to British art, he was created 1st Baron Duveen of Millbank in 1933. He wrote "Thirty Years of British Art" (1930).

Duyckinck (*dū'kīnk*), EVERT AUGUSTUS, author, born in New York City, Nov. 23, 1816; died there, Aug. 13, 1878. A graduate of Columbia Coll. (1835), he studied law and then devoted himself to literature. From 1840 to 1842 he edited the literary monthly magazine *Arcturus*. With his brother, George Long Duyckinck (1823-63) he published and edited the *Literary World*, a well-known literary weekly; he also edited "The Cyclopedia of American Literature" (1855; supplement, 1865). Evert Duyckinck's other works include "National Gallery of Eminent Americans" (1861-62) and "History of the War for the Union" (1861-65).

Dvina (*dvē'nā*) or DŪNA, two major rivers of the U.S.S.R. The *Northern Dvina*, formed by the junction of the Yug and Sukhona rivers in Arkhangelsk region, takes a northwesterly course and flows into the White Sea near Arkhangelsk, the great Arctic timber port. Draining an area of ca. 140,000 sq. m., the river is ca. 470 m. long. It provides a valuable means for inland navigation, fishing, and logging. Canals connect the Dvina with the Neva and Volga. The *Southern Dvina* in western U.S.S.R. rises in the Kalinin region, flows southwest and then northwest through Latvia, where it is called the Daugava. It empties into the Gulf of Riga, ca. 5 m. above Riga. Navigable for two-thirds of its ca. 600 m., it floats great timber rafts to Riga.

Dvinsk (*dvīnsk*). See *Daugavpils*.

Dvořák (*dvór-zhāk'*), ANTONÍN, composer, born in Nelahozeves (Mühlhausen), Czechoslovakia, Sept. 8, 1841; died in Prague, May 1, 1904. Dvořák entered the conservatory of Prague at the age of 16 and later won the friendship of Brahms. In 1890 he was appointed professor of the Prague Conservatory and, in 1901, its artistic director. He visited the U.S. twice and was the director of the National Conservatory of Music in New York, 1892-95.

Dvořák was a prolific composer, the first Czech symphonist, and, with Smetana (*q.v.*), the creator of an original, national style in Czech music. The music successfully blended Slavic folkloristic elements with a technique steeped in the classical and romantic traditions. His wealth of melodic invention and the crispness of his dance rhythms are akin to those of Schubert. Among his compositions are a "*Stabat Mater*" (1884); his fifth symphony ("From the New World," 1893), the "Slavonic Dances" (1878), concertos, string quartets, and other chamber and church music. He also composed ten operas (*e.g.*, "*Rusalka*," 1900) and symphonic poems (*e.g.*, "*The Wood Pigeon*," 1896).

Dwarf (*dwarf*), a term used to designate any plant or animal that is much smaller in size than the average size of development. Individual dwarfs occur in all plant and animal life, though those of the human race have attracted the greatest share of attention and study (see *Midget*). In the Middle Ages and later, a dwarf was often employed as a court fool (*q.v.*); *e.g.*, Charles I of England had a dwarf, Jeffery Hudson (1619-82), who was only 18 in. tall at the age of seven years, but afterward grew to 3 ft. 10 in.

Dwarf Trees (*dwarf trēz*), two types of trees of various species, reduced in size. One type, grown for purely ornamental purposes, is produced by special methods of root-pruning and the trimming and bending of branches. The result is a picturesque miniature of such trees as oaks, pines, and others, often scores of years old,



Courtesy Czechoslovak Information Service, N. Y.
ANTONÍN DVOŘÁK

but usually grown in flower pots. The practice was developed in Japan and China.

Fruit trees are also dwarfed. Apples and other kinds may be grown less than half normal size, but still produce ordinary-sized fruit. This type of dwarfing is accomplished by using special root stock types, such as quince, on which buds or twigs from regular fruit varieties are grafted. In some unknown way, the root stock controls the size of the resulting tree without preventing healthy growth. In apples, such dwarfs are designated as "Malling" types, with different Roman numerals, I, II, etc., which refer to different sizes. Besides providing trees of a size suitable for small yards, these types can be used in large commercial orchards for convenient harvesting.

Dwiggins (*dwig'inz*), WILLIAM ADDISON, typographer, book designer, and calligrapher, born in Martinsville, Ohio, June 19, 1880; died in Hingham, Mass., Dec. 25, 1956. Dwiggins, an advertising and layout man, felt that type and book design in America were not adapted to modern needs, expressing this opinion in "Investigations into the Physical Properties of Books" (1919). Thus winning the interest of publisher Alfred A. Knopf, he was able, in designs for Knopf—and others—to make substantial improvements in book design and to evolve new type faces, e.g., the Caledonia type (1939). He also led a revival of interest in American calligraphy. Some of his writings were collected as "MMS. by W A D" (1949); his "Layout in Advertising" (1928) was influential in its field.

Dwight (*dwit*), JOHN, potter, born ca. 1635; died in Fulham, England, in 1703. He received

DWIGHT

a law degree from Christ College, Oxford, in 1661, but soon turned his interest to the art of pottery and porcelain making. In 1671 he was granted the first patent for "the mistery of transparent earthenware, commonly known by the names of porcelain or china and Persian ware, and of stoneware, vulgarly called Cologne ware." He is the first English potter of distinction, known for the creation of beautiful jars, statuettes, and portrait busts, which are highly priced collectors' items.

Dwight, THEODORE, journalist, born in Northampton, Mass., Dec. 15, 1764; died in New York City, June 12, 1846. He was a brother of Timothy Dwight (1752-1817) and a grandson of Jonathan Edwards. A lawyer of Federalist politics, he was elected to Congress (1806), was secretary of the Hartford Convention (1814), and founded the *Albany Daily Advertiser* (1815) and the *New York Daily Advertiser* (1817). His books include "A History of the Hartford Convention" (1833) and "Character of Thomas Jefferson as Exhibited in His Own Writings" (1839).

Dwight, THEODORE, author, born in Hartford, Conn., March 3, 1796; died in New York City, Oct. 16, 1866. The son of Theodore Dwight (1764-1846), he was graduated from Yale in 1814 and then visited Europe. He taught school and worked on his father's newspaper and for various religious papers. A passionate libertarian, he was deeply interested in the Free Soil movement, and entertained many political exiles from Europe, including Garibaldi, whose "Autobiography" he translated (1859). Among his numerous books are "A Journal of a Tour of Italy" (1824), a "History of Connecticut" (1841), and "The Kansas War" (1859).

Dwight, THEODORE WILLIAM, lawyer, born in Catskill, N.Y., July 18, 1822; died in Clinton, N.Y., June 29, 1892. A cousin of Theodore Dwight (1796-1866), he was graduated (1840) from Hamilton Coll. and then taught there. He later became professor of municipal law at Columbia Law School (1858-91) and lectured on law at Amherst and Cornell.

Dwight, TIMOTHY, clergyman, educator, author, born in Northampton, Mass., May 14, 1752; died probably in New Haven, Jan. 11, 1817. A graduate of Yale Coll. (1769), he became an influential Congregational minister at Greenfield Hill, Conn. (1783-95). Succeeding Ezra Stiles, he was president of Yale Coll. (1795-1817). His widely circulated sermons, based on the strict Calvinism of his grandfather, Jonathan Edwards (*q.v.*), were published as "Theology, Explained and Defended" (5 vols., 1818-19).

Dwight, TIMOTHY, educator, born in Norwich, Conn., Nov. 16, 1828; died in New Haven, May 26, 1919. After his graduation from Yale Univ. in 1849, Dwight engaged in the study of

theology for several years. In 1856-58 he studied in Berlin and Bonn, Germany. On his return to America he became professor of sacred literature in Yale Theological Sem. and was made president of Yale in 1886, which position he resigned in 1899. He wrote a number of textbooks, was influential as a lecturer, aided in revising the Bible, and was connected editorially with the *New Englander*. His chief publication is "The True Ideal of an American University."

Dwight, WILLIAM BUCK, scientist, born in Constantinople, Turkey, May 22, 1833; died Aug. 29, 1906. He was the son of Harrison Gray Otis Dwight (1803-62), an American missionary. In 1849 he came to the U.S. and was graduated from Yale Univ. in 1854, and subsequently attended Union Theological Sem. and Yale Scientific School. He spent several years in examining mines in West Virginia; in 1867 he became a teacher at West Point, and was made one of the two university examiners for the State of New York in 1894. He devoted much time to investigations of limestones in New York, especially in the Wappinger Valley. He contributed to periodical literature and published a number of works relating to geology. He invented a machine for cutting minerals and fossils into thin sections and edited a department in the "Standard Dictionary."

Dwina (*dwe'na*), a river of northern Russia. See *Divina*.

Dyaks (*dī'aks*), the name applied to the aborigines of Borneo, who chiefly inhabit the interior. They have made considerable advancement in agriculture and other arts. Their complexion is yellow, and in docility and industry they rank far above the Malays. In worship they are classed as pagans. Considerable advancement has been made in civilization, especially in the vicinity of Sarawak. The former practice of head hunting, an art in which they engaged to secure the heads of their enemies, has been abolished in all districts where Europeans have exercised influence. Most of the Dyaks are under the government of Holland.

Dyeing (*dī'ing*), the art of coloring fibers or fabrics. The natural fibers of wool, silk, cotton, linen, hemp, ramie, and the synthetic fibers of rayon, acetate, nylon, etc., are dyed as yarn or fabric. Fabrics may also be dyed by printing machinery, or by hand-blocking using waxes to protect the area which is to be left natural or of a basic color. Different fibers take color differently, and it is necessary to pass them through various preliminary operations. Material which prevents dye from having free access must be removed. Bleaching is applied to linen and cotton fabrics before dyeing; silk is treated to remove natural oils; wool is scoured in soda, lye, dilute ammonia, or weak soap. Dyes are of vegetable, animal, mineral, or coal-tar derivation. Originally, dyes were

mainly of vegetable origin, such as madder, saffron, weld, logwood, and Brazilwood; or of insect origin, such as cochineal, kermes, and lac. Modern dyes are largely derived from coal-tar, such as the wide range of aniline dyes. Dye baths vary in composition, with acid or alkaline reaction, salts to increase the absorption of dye, wetting agents, and in some cases reducing agents. Each dyestuff and fiber has its best method of application. Dyestuffs may be used directly where the fibers are capable of absorbing the dyes. In some cases, a mordant must be incorporated with the fiber before the color can be absorbed. In other dyes the color is developed by incorporation of one substance into the fiber, followed by a secondary reaction of another solution.

Dyer's Broom (*dī'ers brōom*), or DYER'S WEED, or WOODWAXEN, a low shrub of the pea family which yields a yellow dye. It is native to Europe and naturalized in North America. The plant has simple leaves and yellow flowers. It is reputed to be the *genêt*, a twig of which the Plantagenet family wore as a badge and from which it took its name.

Dymov (*dī'mōf*), OSSIP (pseudonym of JOSEPH PERELMAN), writer, born in Bialystok, Russia, Feb. 17, 1878; died in New York, N.Y., Feb. 2, 1959. Educated in St. Petersburg (now Leningrad), he came to the U.S. as a young man and became widely known for his plays produced in the Yiddish theater, among them "The Eternal Wanderer" (1913), "Singer of His Sorrows" (1918), "Bronx Express" (1922), "The Last Beloved" (1926), and "East Side Professor" (1939). He also wrote "The Boy Vlass" (1908, a novel) and several volumes of memoirs. In the 1940's he abandoned writing and turned with some success to sculpture, which he had studied as a youth.

Dynamics (*dī-nām'iks*), the branch of physics which deals with the mathematical theories of forces in action. Subdivisions of dynamics include kinematics, which is the science of motion as distinguished from the forces which produce it; and kinetics, which deal with the action of forces upon bodies. The first experimental work leading to the laws of dynamics was published (1638) by Galileo Galilei (1564-1642), wherein he showed that all bodies possess inertia which causes them to resist a change of motion. He also set forth the concepts of momentum, velocity, and acceleration, anticipating the work of Isaac Newton (1642-1727), who evolved the laws which are basic to dynamics: 1) A body continues at rest or in a state of uniform motion unless compelled to change by applied force; 2) the rate of change of momentum of a body is proportional to the force acting upon it and takes place in the direction of the acting force (momentum equals mass times velocity); 3) to every action, there is an equal and opposite reaction.

Dynamite (*dī'nā-mīt*), the first high explosive, invented by Alfred Nobel (*q.v.*), Swedish engineer, in 1867. It was first produced by absorbing nitroglycerin in kieselguhr, an infusorial earth from Oberlohe, in Hanover, Germany. The detonation of this original dynamite, when frozen, was unpredictable. To overcome this, present-day commercial dynamites contain added nitroglycol which acts as a freezing-point depressant. Instead of the original kieselguhr, absorbent combustible materials, such as wood pulp, starch, or cereal meal have been substituted, and oxidizers, especially potassium nitrate or sodium nitrate, are added.

Dynamite is detonated by using either an electric or nonelectric blasting cap. Dynamite is rated for strength on a percentage basis, with straight dynamite, the most sensitive of all, taken as the basis for comparison, weight for weight. Straight dynamite contains up to 60 per cent of nitroglycerin absorbed in some combustible material. It is used for primers, deep-well blasting, and submarine blasting. Ammonia dynamite has ammonium nitrate substituted for part of the nitroglycerin or "explosive oil," which is a combination of nitroglycerin with the freezing-point depressant. Ammonia dynamite is a cheaper and less violent explosive than straight dynamite. Gelatin dynamite is nitroglycerin gelatinized with gun-cotton, plus absorbent wood meal. It is a plastic dynamite and possesses a violent shattering effect. As it gives off fewer poisonous fumes on detonation, it is especially useful for underground blasting. Early attempts to use dynamite as a military explosive in warfare were not wholly successful. Today dynamite is strictly an industrial explosive.

Dynamo (*dī'nā-mō*), also referred to as MOTOR or GENERATOR, a machine for generating electricity by mechanical action, or for transforming electrical energy into mechanical energy. A dynamo-electric machine may serve either as a generator or a motor, depending upon whether it is supplied with mechanical energy or electrical energy; hence, whether it is giving out electrical or mechanical energy.

In Figure 1 are shown the essential parts of a simple dynamo. Here the two magnetic poles, N and S, of a horseshoe magnet are shown. Between the poles is a field of magnetic lines of force, represented in the illustration by dotted lines. As the shaft is revolved rapidly the coil (*q.v.*) cuts lines of force and has induced in it an electromotive force, which depends upon the rate at which lines are cut. If the ends of the coil are connected to a closed circuit exterior to the magnetic field, a current will flow through it as indicated by the two arrows in the illustration.

In the dynamo shown in Figure 2 the armature consists of a very large number of turns of

wire. It rotates between pole faces of iron. The magnetic field is produced by passing electric current through the coils wound on the four spools at the top and bottom of the machine.

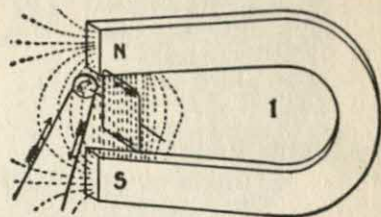
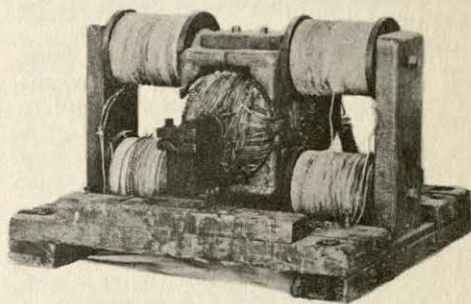


Figure 1
SIMPLE DYNAMO

This crude dynamo was first constructed in 1878. A modern dynamo has the armature coils wound on a steel drum. In operation the armature is revolved rapidly between the poles of the electromagnets spaced around the outer shell. The commutator is fixed on the shaft on which the armature revolves. Brushes bear against the armature, and by means of these the direction of current in the armature is reversed every half revolution. The electromotive force developed by the machine depends upon the number and strength of the magnetic poles within which the armature is revolving, and the speed of rotation.

Although the action of the machine illustrated is described as that of a generator, the same machine may be used as a motor, if electric current from an outside source be sent into the armature through the brushes and commutator. In the case of the motor the current for exciting the field magnets is obtained from the same source as the

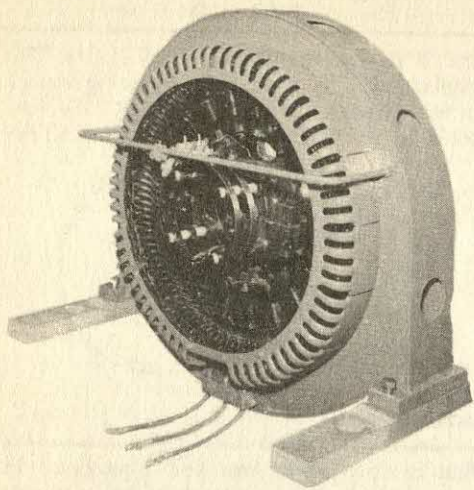


Courtesy General Electric

Figure 2
DYNAMO, 1878

current for the armature. Some generators are self-excited and produce the current for their own field coils, while others are separately excited and require an external source of power for the field coils.

The extensive use of the dynamo dates from improvements made in the construction by Zénobe



Courtesy General Electric

MODERN A.C. GENERATOR

Gramme, of Paris, in 1868. Gramme's major improvement consisted of a new method of winding the armature coils upon a ring, called a Gramme ring. The term dynamo is not usually applied to a machine generating alternating current; originally referred to as an alternator, such a machine is known today as a generator (*q.v.*). Huge electric generators for using the power of the water trapped at Hoover Dam on the Colorado River develop 82,500 kw. power. Each generator is operated by a water turbine which delivers 115,000 horsepower and utilizes a water pressure or head of 510 ft. Electric power is supplied by these generators to cities as far away as Los Angeles. Other large generators installed at Grand Coulee Dam are rated at 105,000 kw. See also *Dam*.

Dynamometer (*dī-nā-mōm'ē-tēr*), an instrument to ascertain the strength of men and animals, and to determine the power exerted by machines. Three classes of dynamometers are in use, including those designed to indicate the force of *thrust*, of *traction*, and of *rotation*. A thrust dynamometer is attached to the screw shaft of a steamship and measures the force of the screw in driving the vessel through the water. A simple traction dynamometer consists of a spring balance, in which the power exerted is indicated by an index upon a scale of figures. It may be fastened to a wagon or a plow, and when the team of horses pulls the load it shows the force exerted. The force of a shaft is measured by a rotary dynamometer, indicating the force transmitted by the shaft to other machinery.

DZIGGETAI

Dynasty (*dī'ngs-tī*), a succession of sovereigns in one line of family descent, or derived from the same ancestral stock. Among the noteworthy dynasties are the Hohenzollern of Germany, the Hapsburg of Austria, the Stuart of England, and the Castile of Spain.

Dyne (*din*), in physics, the unit of force (*q.v.*) employed in the centimeter-gram-second system (C.G.S.). It is equal to a force that, acting upon one gram of matter for one second, will give it a velocity of one cm. per second. Since the dyne is a small unit, it is more convenient to use the *megadyne*, which is equal to 1,000,000 dynes.

Dysentery (*dīs'ēn-tēr-ē*), in medicine, a disease of the intestines characterized mainly by discharges from the bowels in the form of diarrhea (*q.v.*); sometimes mucus and blood are discharged. The disease is caused either by certain bacteria of which several types are known or by so-called amebas. The disease often affects other digestive organs. Proper sanitation facilities are important in preventing dysentery.

Dysmenorrhea (*dīs-mēn-ō-rē'ā*), in medicine, a term designating irregular and painful menstruation.

Dysodile (*dīs'ō-dīl*), a coal-like mineral of a thin, leaflike texture. Composed of some 70% carbon, 17% oxygen, 10% hydrogen, and small amounts of sulfur and nitrogen, it burns readily but with the characteristic unpleasant odors of the two latter elements.

Dyspepsia (*dīs-pēp'shā*), a general medical term used to describe the condition of discomfort resulting from improper functioning of the digestive organs. Symptoms covered by the term vary in degree from simple indigestion to more complicated disorders of the digestive tract.

Dytiscidae (*dī-tis'i-dē*), a family of predaceous diving beetles of worldwide distribution, embracing about 2,200 species which inhabit both fresh and brackish water. The body is an elongated oval, usually colored black, brown, or dull green. They have flattened hind legs adapted for swimming, and short threadlike antennae. They are strong flyers and are frequently caught around electric lights. In ponds they eat other insects, worms, molluscs, and small fish. The larvae are called *water tigers*; the pupae are terrestrial.

Dziggetai (*dzig'gē-tī*), also called KULAN, KULON, and CHIGETAI, a wild ass, now reported common only in Central Mongolia, hence it is known scientifically as the Mongolian Wild Ass (*Asinus hemionus*). Closely resembling other Asiatic wild asses, it is about 3 ft. and 10 in. high. Its color is reddish yellow with a gray tinge and a blackish stripe down the back.



E (*ē*), the fifth letter and the second vowel of the English alphabet. It is used more frequently than any other of the 26 letters. Its natural or long sound is the same as *i* in the German, Italian, and French languages, as in *me*, *mere*, and *here*. The short sound of *e* is represented in words like *men*, *hen*, and *met*, while its sound equivalent to *a* is exemplified in *there*. Several modifications are recognized when long and short *e* are followed by *r*, as in *here* and *her*; and the *u* or *dropped sound*, as in *camel*. In pronouncing it the mouth is opened to a medium extent, the tongue is expanded to touch the upper molars, and the voice is gently expurgated. It is generally silent as a final letter, but serves to lengthen the preceding syllable, as in *plume*, *cane*, *mane*, though in some cases it exercises no influence on the preceding vowel, as in *give* and *gone*. The final *e* was pronounced in most cases up to the end of the 14th century, as is the case in Chaucer's "Canterbury Tales."

In music it is the third note of the diatonic scale of C. E, as a key in music, has four sharps in its signature, F, C, G, and D sharp; but minor E, as a key, has but one sharp, F. The abbreviation E. signifies East.

Eads (*ēdz*), JAMES BUCHANAN, engineer, born in Lawrenceburg, Ind., May 23, 1820; died in the Bahama Islands, Mar. 8, 1887. He settled at St. Louis in 1833 and became a clerk on a steamboat six years later. In 1842 he designed a diving bell. Later he constructed several boats for raising large steamers, employing them in the Mississippi, and established the first glass works west of the Mississippi in 1845. When the Civil War commenced, he was called by President Lincoln to aid the national government, and constructed eight ironclads in about three months, these

steamers being employed in the capture of Ft. Henry. Later he built other ironclads and mortar boats. He commenced the seven-year construction of the steel-arch bridge across the Mississippi River at St. Louis in 1867. Subsequently he deepened the Southern Pass at the mouth of the Mississippi by means of jetties, and planned the deepening of the river from its mouth to the mouth of the Ohio. Later he organized a company and engineered the building of a ship railway across the Isthmus of Tehuantepec, and was connected with other large enterprises. The British Society of Arts awarded him the Albert Medal in 1884.

Eagle (*ē'g'l*), the name by which many birds of prey are known. They are classed in the genus *Aquila* and the family *Falconidae*, with which the eagles, falcons, and hawks are included. Eagles are regarded as the most noble and courageous of the rapacious birds, and soar higher than any other birds of flight. The *golden eagle* has a dark, tawny-brown color, with a yellowish tinge on the back of the head and neck, and is a large and beautiful bird. It attains a length of about 3 ft. and is able to seize any kind of poultry, rabbits, and small quadrupeds and carry them to its nest in the rocky ledges and cliffs of mountains. This species is a common bird of many regions of Eurasia and North America. The *sea eagle* is found near the coasts of lakes and seas and feeds largely on fish and marine life. It has a grayish-brown color, white tail, and pale-colored head. The *bald eagle* is found in America and northern portions of Eurasia, and has been adopted as the symbol of the U.S. and some other countries. Its general diet is more extended than that of the *tree eagle*, and carrion is even taken in time of need. The *serpent eagle* is found in Southern Asia and Northern Africa, and in structure

and habits approaches the buzzard. Other species include the *imperial eagle*, the *eagle hawk*, and the *crested eagle*. These birds are fond of fish and commonly feed on dead fish found along the shore. They are frequently seen in pursuit of the osprey and other birds, requiring them to drop the fish they may have caught.

The eagle is the most-used bird among symbols of societies and nations. The Persians bore an eagle as a symbol upon a spear in battle as early as 401 B.C., and from them it passed as a war standard to the Egyptians. Among the Romans it was customary to use eagles of silver and, more



Courtesy U. S. Forest Service

BALD EAGLE

rarely, of gold, as standards, the custom being introduced among them in 104 B.C. The dynasty of Napoleon adopted the eagle as a symbol for France. A double-headed eagle was introduced as the emblem of Russia, and Charlemagne introduced the eagle into Germany as a standard. The Russians had an association known as the White Eagle Order of Knighthood, and the German Empire had Orders of the Black, Golden, and Red Eagles.

The Prussian Order of the Black Eagle was founded by the elector of Brandenburg in 1701. Its decoration consists of a Maltese cross surmounted by a royal crown; this cross was given by the emperor for meritorious service. France long held the eagle in high esteem as a symbol, but it was abolished with the rise of the republic in 1870. The bald eagle is the emblem of the U.S. and is represented with outstretched wings, with an olive branch in one talon, a bunch of arrows in the other, and a shield upon its breast. Its head is surmounted by 13 stars, while in its beak is a band bearing the inscription "E pluribus unum."

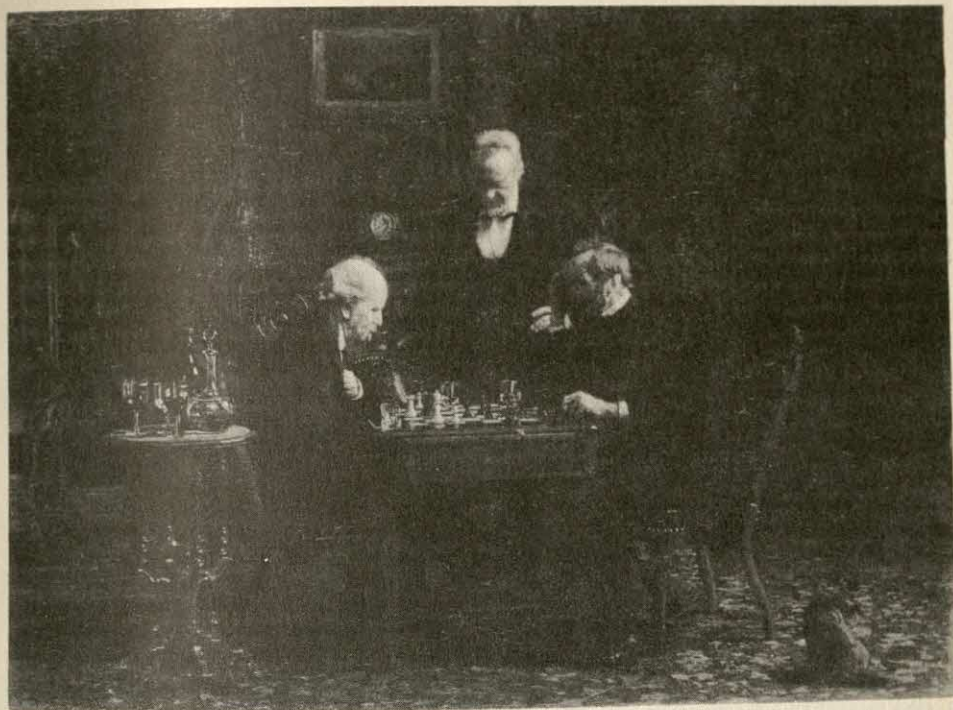
Eagle, formerly a gold coin of the U.S., worth \$10. It was first coined in 1795, weighing 270 grains and containing 247½ grains of pure gold. Later the government began to coin of the same fineness and of proportional value the double eagle, half eagle, and quarter eagle. The eagle was withdrawn from circulation by the Gold Reserve Act of 1934, a measure to stabilize the currency.

Eaker (ē'kēr), IRA C., officer and executive, born in Field Creek, Tex., in 1896. Commissioned a second lieutenant in 1917, he was sent to Kelly Field, Tex., became a flying officer a year later, and by 1922 was in command at Mitchel Field, Long Island, N.Y. He served as assistant executive in the office of the Chief of Air Corps from 1924 to 1926, when he participated in a good-will flight to South America. Three years later he established a world endurance flight record as chief pilot of the plane *Questi Mark*. While attending the Command and General Staff School in 1936, he wrote—with Gen. Henry H. Arnold—his first book on aviation, "This Flying Game," and the same year made the first transcontinental blind flight. A temporary brigadier general in 1942, Eaker was put in command of the American 8th Air Force, the first American bomber group to raid Germany in World War II, and in 1943 was made commander of the Allied Mediterranean Air Force. Eaker was appointed Deputy Commander A.A.F. and Chief of Air Staff in 1945. Made a major general in 1946, he retired in 1947, becoming an executive in private industry.

Eakins (ā'kīnz), THOMAS, artist, born in 1844 at Philadelphia, Pa.; died in 1916. He was one of a group of American artists, including Winslow Homer and Albert P. Ryder (*qq.v.*), who incorporated in their work, without regard for contemporary popular taste, influences received through foreign studies and travel. Using a realistic approach, Eakins presented essentials objectively and with a clear feeling for composition. He is noted for portraits, landscapes, and genre scenes and has influenced a large group of American painters. Among his best-known works are: "Miss van Buren," "Cardinal Martinelli," "Chess Players," "John Biglen in a Single Scull," and "Clinic of Professor Gross." See next page for a painting by Eakins.

Eames (āmz), EMMA, soprano, born in Shanghai, China, Aug. 13, 1865. Her father, an American, was a lawyer in the international court of Shanghai. She spent her childhood in Boston, Mass., where she studied music. Later she received musical instruction in Paris, France, and made her debut as *Juliette* at the Paris Grand Opera in 1889. Two years later she sang successfully in London and New York, and while in the former city married Julian Story, the portrait painter. Later divorcing him, she married the baritone, Señor de Gogorza. She retired from the stage, 1909, but gave concert recitals for three more years. Among her leading parts were the Countess in "Le Nozze di Figaro" and the title role in "La Tosca." She also scored success in Wagnerian roles. She died in 1952.

Ear (ēr), organ of hearing. It is divided into three parts: the external ear or concha, the mid-



Courtesy Metropolitan Museum of Art, N. Y.

THE CHESS PLAYERS. PAINTING BY THOMAS EAKINS

dle ear or tympanum, and the internal ear or labyrinth. The *external ear* consists of a passage to the middle ear, is about an inch in length and a quarter of an inch in diameter, and is formed partly of flesh and partly of bone. Around its opening is a lobe, called the *auricle* or *pinna*, which serves to collect sound waves. Rudimentary muscles are connected with the external ear and are so well developed in some persons that they can move their ears as a rabbit or a horse does. The outer half of the passage is provided with a number of glands that secrete a kind of sticky wax, which prevents dust and insects from reaching the drum membrane. The gland secreting the wax grows outward toward the surface like the nails and prevents it from accumulating. Carelessness in picking the ear sometimes causes the wax to crowd against the drum membrane and results in partial or total deafness.

The *middle ear* is provided with a special mechanism for transmitting the air vibrations to the inner ear through two outer cavities. The tympanum or middle ear is connected by a small aperture with the inner ear. As to the size, the breadth of the middle ear is about a quarter of an inch and its length a half an inch. It is lined with mucous membrane and filled with air. The drum membrane is a thin leaf which closes the outer end like a drum, and a similar membrane closes the aperture to the inner ear. The cavity of the

middle ear is increased by extending backward into a bony projection, which can be felt behind the outer ear, and is called the *mastoid process*. From this a tube, called the *eustachian*, about the size of a knitting needle, passes to and connects with the pharynx, and is opened by the act of swallowing. A chain of three small bones, known as the *ossicles*, constitutes the essential part of the middle ear. These are called the *malleus* or *hammer*, the *incus* or *anvil*, and the *stapes* or *stirrup*, and extend across the cavity from one membrane to another.

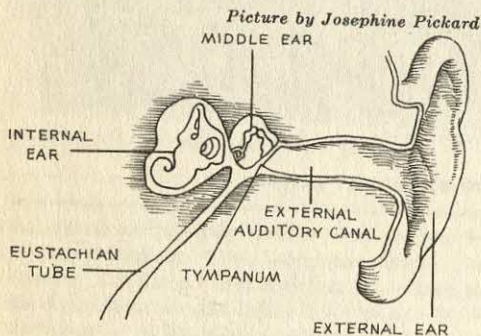
When sound waves strike the ear drum, they are thrown into vibrations, which are transmitted to the inner ear by a chain of bones. The vibrations are increased by the tympanum and its extension into the mastoid cells, which act like the sounding box of a violin. The *internal ear* or *labyrinth* is the most delicate part. At its center it is about an eighth of an inch in diameter, this part being called the *vestibule*. A small spiral tunnel extends from the vestibule, which is called the *cochlea* from its resemblance to the inside of a snail's shell, and, besides it, there are three other tunnels called from their shape the *semicircular canals*. A clear liquid fills the labyrinth, which is lined with epithelial cells, and in them the nerves of hearing end. Cilia are numerous upon the surface of the epithelium, and among them are hard particles called the *ear sands*. When the

EARHART

sound waves reach the liquid, they produce waves that beat against the cilia, thus causing the hearing of sound.

In order to produce a sound it is necessary that the waves in the liquid surrounding the nerves occur at least 16 times a second. When they occur more than 38,000 times a second, no sound will be heard for the reason that they are too rapid for the nerves to take account of their action. The nerves of action may be excited by the air in the middle ear being too dense or too rare, by too much blood circulating in the middle ear, and by a blow upon the head or wax in the ear. Quinine and other drugs tend to produce abnormal excitement. In some cases an impression passes to the brain by the auditory nerve as though a real sound had excited the nerves. Other illusions are caused by an excitement of the pulse in an insane person.

HUMAN EAR



Birds and quadrupeds have ears corresponding to those in man. No outer ear is found in turtles and frogs, but the drumhead forms a visible circle behind the eyes, just under the skin, and the middle ear contains a single bone. Snakes have no external or middle ear, but a bone extends from the inner ear to a kind of membrane immediately below the skin by which they are able to hear. The vibrations in fish are transmitted only through the skull, since they have no external or middle ear, and the labyrinth has no cochlea. Other animals have ears more or less modified, and those that have ears at all possess a modified form of the internal ear. See *Sound*.

Earhart (*är'härt*), AMELIA, aviator, born in Atchison, Kans., July 24, 1898; lost at sea near Howland Island in the Pacific, July 1937. She made the first solo flight by a woman across the Atlantic in 1932 and repeated that feat over the Pacific, from Hawaii to California, in 1935. Her last trip, with navigator Frederick Noonan, was an attempt to fly around the earth at middle latitudes, a dangerous flight because much of the course was then uncharted. In 1931 she married George Palmer Putnam, a New York publisher,



AMELIA EARHART

who edited her final book, "Last Flight" (1937). She also wrote "Twenty Hours and Forty Minutes" (1928) and "The Fun of It" (1932).

Earl (*ērl*), title in British peerage, originally an office (*ealdorman*) conferred among the nobles, making them judges and governors over certain districts. William the Conqueror (1027-87) made the earldoms hereditary institutions, thus probably initiating conversion of the title to one of dignity. From the time of Edward III (1312-77), earldoms have been created by charter or patent. Today an earl ranks third in British peerage. The wife of an earl is addressed as *countess*, the eldest son assumes the courtesy title of *viscount*; younger sons are the *honorable* and daughters *ladies*.

Early (*ēr'li*), JUBAL ANDERSON, army officer, born in Franklin County, Virginia, Nov. 3, 1816; died in Lynchburg, Va., March 2, 1894. A graduate of West Point (1837), a lawyer, and a member (1841-42) of the Virginia legislature, he joined the Confederate forces as a colonel in 1861 despite his expressed opposition to secession. A lieutenant general by 1864, he was particularly noted for his Shenandoah Valley campaign of 1864-65. After his defeat by Gen. George A. Custer at Waynesboro in March 1865, he was relieved of his command by Gen. Robert E. Lee. Following a period of self-exile in Mexico and Canada, Early returned (1869) to Virginia and resumed his law practice. His memoir on the last year of the Civil War was published in 1866, and he remained deeply interested in Confederate history.

Earring (*ēr'ring*), an ornament suspended from the ear, the lower part of which is sometimes pierced for the purpose. Orientals have prized this mode of adorning the person from remote antiquity. Anciently, earrings were worn by both sexes in many countries of Asia and Africa, especially in Persia, Egypt, Babylon, and Carthage. The fashion was confined to women in Greece and Rome, where the people looked

upon this ornament as one especially fitted for those of rank. In the time of Queen Elizabeth, it became fashionable for both sexes to wear earrings; and, in some countries, the custom still prevails to a considerable extent among men and among certain classes of laborers, especially sailors. During the 19th century, the use of earrings declined in Europe and America, but in the 20th century their popularity among women has been increasing. Earrings are made of silver, gold, plastics, and ceramics, of all colors, shapes, and varieties, with either clips or screw fasteners. The practice of piercing ear lobes is now only occasionally seen among American or English women. All of the more valuable antique earrings are finely ornamented and contain settings of jewels. Many ornaments classed as earrings are not properly rings but are attached to the ear with a hook or clip. Sizes and values vary greatly according to changes in the fashion.

Ear-Shell (*ēr'shēl*), a marine gastropod. See *Abalone*.

Earth (*ērth*), one of the nine planets which revolve round the sun. Its average distance from the sun is 92,900,000 m., and from the sun it receives energy in the form of light and heat which make life possible. The earth's only natural satellite is called the moon, whose orbit is an average of 239,000 m. distant.

FORM AND SIZE: While primitive man believed the earth to be flat, even such ancient civilizations as that of the Babylonians were aware of its spherical shape. Ingenious measurements made by Eratosthenes (273-192 B.C.) yielded surprisingly accurate figures for the earth's circumference and distance from the sun. Of course, the ignorant and superstitious have always held to a belief in a flat earth or to such variations as that the earth's surface is the shell of a celestial tor-

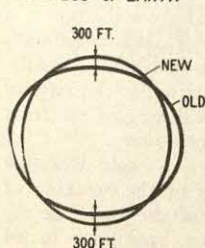
toise, but for thousands of years educated people knew of its actual shape. Today it is known that the earth is not a perfect sphere, but rather that it is slightly flattened at the poles and enlarged at the equator due to centrifugal distortion. (The North and South Poles are the points of the earth's surface through which passes the axis about which the earth rotates; the equator is an imaginary line around the earth halfway between them.) Recent measurements indicate that the earth is slightly pear-shaped, in addition to its flattening at the poles. The narrow end of the earth is in the Northern Hemisphere, while the broad base is in the Southern. The maximum extent of this distortion is about 50 ft. in radius. The polar radius of the earth is 3,950 m. and the equatorial radius 3,963 m. The circumference of the earth at the equator is 24,900 m., and the surface area of the earth is about 197,000,000 sq. m.

Mass: The mass of the earth is 5.98×10^{24} kg., which is equivalent to a weight of 6.60×10^7 tons. Newton was the first to indicate a method for determining the earth's mass. He suggested that if a plumb bob were suspended near a mountain whose mass could be reliably estimated, the amount by which the bob deviated from the vertical would indicate the ratio between the masses of the earth and the mountain. The first such measurement was made in 1738 by Bouguer on Mt. Chimborazo in Peru. Subsequently, another means of "weighing" the earth resulted from Cavendish's determination of the universal constant of gravitation G . By making use of this figure, together with the known values of the earth's radius and the acceleration caused by gravity, it was possible to compute the earth's mass. The average density of the earth is 345 lb. per cu. ft., which is nearly twice the density of rocks on the surface. It is evident, therefore, that the greater part of the interior of the earth must be composed of materials of extremely high density.

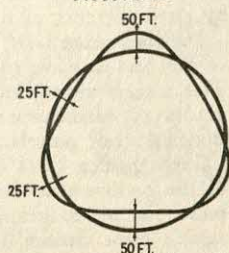
INTERIOR: Most of our knowledge of the earth's interior comes from seismological evidence. Two types of waves radiate from an earthquake, the primary, or P , waves and the secondary, or S , waves. The faster P waves are longitudinal in nature, much like sound waves, while the S waves are transverse vibrations. Both P and S waves can pass through a solid, but only P waves can be transmitted through a fluid. By picking up P and S waves from an earthquake which occurred at a known place and time at various stations throughout the world, seismologists have been able to infer a great deal about the structure of the earth's interior. Thus, the earth seems to consist of several concentric shells: the outermost one is the *crust*, which is about 25 m. thick beneath the continents; next is the *mantle*, about 1,800 m. thick; and then there is an inner *core*, with a radius of 2,160 m. P and S waves are ob-

EARTH'S SHAPE FROM ORBIT OF VANGUARD SATELLITE (1958β)

NEW FIGURE FOR "FLATNESS" OF EARTH



"PEAR" SHAPE DISCOVERED



EARTH MEASUREMENT

Space exploration has caused some scientists to describe the earth's shape as somewhat like that of a pear, with the narrow end in the Arctic and the broad base in the Antarctic.

served to be transmitted through the crust and mantle, but only *P* waves traverse the core. Hence it seems likely that the core is liquid, an inference supported by theoretical and laboratory studies of the behavior of matter at high temperatures and pressures. The core itself seems to contain an *inner core*, with a radius of 800 m., which may be solid although the evidence is not conclusive. It is believed that the predominant constituent of the mantle is the mineral *olivine*, and that the core is molten iron, probably with some nickel present as well.

ORIGIN: There is a great deal of evidence that indicates that the earth and the sun are both 5,000,000,000 to 6,000,000,000 years old. The most natural explanation is that the sun and the solar system around it originated in the same cosmic process, which was probably the condensation of an interstellar gas cloud. Almost all of the cloud went into forming the sun, but a small fraction remained behind in space to condense into planets and their satellites. According to one theory, the earth was once 1,800 times its present diameter and 500 times heavier, with its constituents in the form of gases and small particles. The moon with the earth forms a double-planet system, rather than a true planet-satellite system, in the view of many astronomers. About 4,500,000,000 years ago, the earth assumed its present form. In the course of contracting, gravitational energy was released, which, together with energy released in the radioactive decay of such elements as uranium and potassium, still persists as heat in the earth's interior. Thus, there is observed a rise in temperature of 30° C. for every mile of depth in the crust; this rate does not continue, however, for very far, and it is believed that most of the earth is at a temperature of 5,000-10,000° C.

MOTION: The earth has two principal motions, the *diurnal* and the *annual*. The diurnal is its daily motion from west to east around its own axis of rotation, which requires 24 hr. with respect to the sun. Because of the earth's motion around the sun, the sidereal day, which is the period of rotation with respect to the stars, is 3 min. 5.9 sec. less. This rotation is the cause of day and night. The annual motion is the revolution of the earth around the sun, which is completed in 365 days, 5 hr., 48 min., 46 sec. The path taken in the course of the annual motion is the earth's orbit, which is in the form of an ellipse, with the sun at one focus. The distance from the earth to the sun varies during the year, being 89,897,000 m. at perihelion (about Jan. 1 of each year) and 92,963,000 m. at aphelion (six months later). The average orbital velocity of the earth is about 19 m. per sec., while the rotation on its axis causes a point on the equator to travel about 1,042 m.p.h. However, the surface velocity due

to rotation diminishes to zero at the poles.

SURFACE PHENOMENA: About 150,060,000 sq. m. of the surface of the earth are water and 46,940,000 sq. m. are land. The water surface is divided into five great oceans and numerous bays, seas, gulfs, and channels. Lakes, rivers, and glaciers are classed as features of the land surface, though the waters of most of them flow into the oceans. Tides, currents, and waves are great phenomena of the oceans, while earthquakes, rains, and winds equally affect both the water and the land surfaces. The Eastern Hemisphere contains the greater portion of the land masses, including all of Europe, Asia, Africa, and Australia, while the Western Hemisphere includes the Americas. The only great land masses south of the equator are Australia, portions of South America and Africa, and Antarctica. Besides the continents, there are detached masses called islands. These are called continental, when near the continent; oceanic, when far out in the oceans; volcanic, when of volcanic origin; and coral, when built largely by the coral polyps. The greatest depths of the oceans are equal to the heights of the loftiest mountains, about 29,000 ft., and usually are found near the greatest land elevations. Land masses have irregular coast lines and surfaces variously comprising valleys, plains, deserts, plateaus, mountains, and depressions below the sea level. The three kingdoms studied in relation to the earth are those of the minerals, plants, and animals. According to latest reports, the earth's total population is *ca.* 2,735,000,000. See *Atmosphere; Geology; Planets; Population; Season*; for an aerial photograph of the earth, see *Photography*.

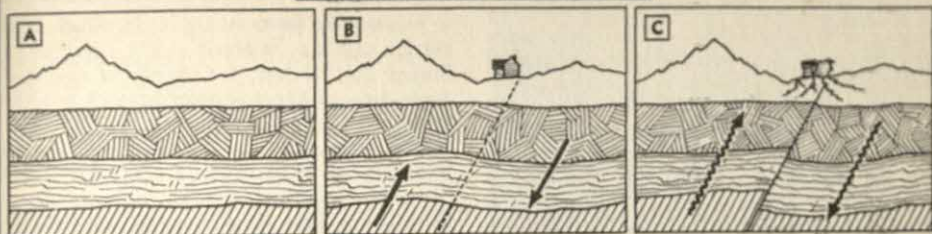
Earth Currents (*ērth kūr'entz*), natural electrical disturbances which appear to be allied closely to magnetic storms, and are associated with the magnetism of the earth. Though not well understood, they are known to be dependent upon or affected by the occurrence of spots on the sun and by the appearance both of aurora borealis and aurora australis. Communication by long lines of telephone or telegraph, and especially by submarine cables, is affected constantly by earth currents, as are radio waves also.

Earthenware (*ērth'en-wär*), any object made of clay and dried in the sun or baked in a kiln. This term is sometimes restricted to the inferior grades of earthenware as distinguished from stoneware and porcelain. See *Pottery*.

Earthquake (*ērth'kwāk*), a rapid vibration of the earth caused usually by the breaking of rocks due to readjustment of the shape of the earth's crust. Strain develops, resulting in an eventual break. The sudden motion produces elastic vibrations which may be violent enough to destroy buildings near the center. All but minor earthquakes may be detected by a seismograph (*q.v.*) anywhere on earth. Small local

HOW EARTHQUAKES HAPPEN AND ARE RECORDED

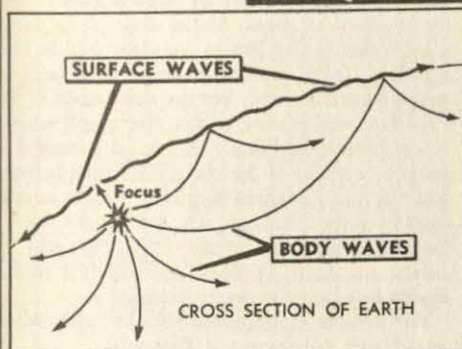
THE EARTHQUAKE PROCESS



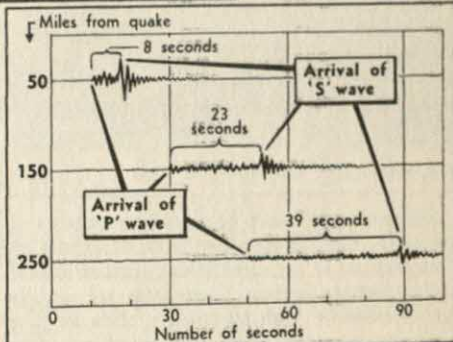
Earthquakes result from the slippage of rock beneath the earth's surface. Strains develop in areas where the earth's structure is undergoing change. Thus, over the years, a cross-section of the earth's crust that may have been like (A), above, is deformed as in (B). Even-

tually, when the strain exceeds the breaking point of the rock, the earthquake occurs (C)—generally along a line of weakness called a fault. This relieves the strain but there may be further quakes if the stress builds up and exceeds the frictional forces along the fault.

EARTHQUAKE WAVES AND RECORDS

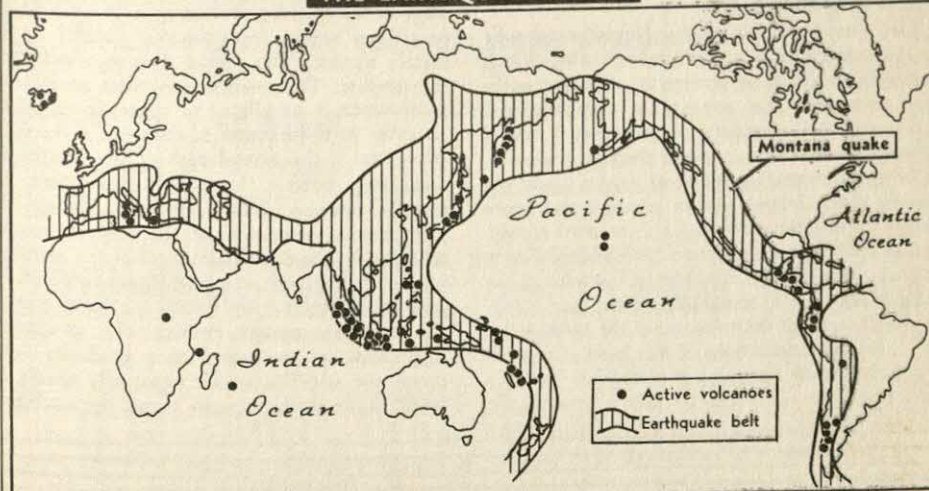


Vast energy is released at focus of quake and much of it travels through the earth (body waves) and along its surface (surface waves). The waves are recorded by seismographs, and study of seismic records yields information on location of quakes and composition of the earth.



For example, the two types of body wave, P and S waves, travel at different speeds. The farther a seismograph is from a quake the greater the lag between arrival of P and S waves, as shown on seismic records above. Plotting distance from three or more stations can locate focus of quake.

THE EARTHQUAKE AREAS



Earthquakes are concentrated in the world's geologically "young" areas where mountain-building is still slowly going on. Quakes are associated with (but not dependent on) volcanic activity, as shown on map.



SAN FRANCISCO EARTHQUAKE, 1906

tremors or quakes may be caused by eruption of volcanoes. Earthquakes are most numerous in those portions of the earth where great structural changes are occurring. Such areas are usually characterized by high mountains, often in close proximity to ocean deeps. Volcanoes are often found in the same general regions. Major earthquake belts of the earth are as follows: (a) roughly the perimeter of the Pacific Ocean, including the Caribbean area; (b) a belt through China, India, Iran, Asia Minor, the Mediterranean Sea, and the Azores. Earthquakes may occur infrequently in other parts of the world and may even be of great violence.

Earthquake records obtained by seismographs permit identification and timing of various kinds of waves, which have arrived by different paths and velocities. The primary or compressional wave and the secondary or shear wave travel directly but at different speeds through the earth, arriving at somewhat different times, while the usually much larger surface waves travel more slowly around the earth and are recorded considerably later at distant points. The differences in arrival times of the characteristic waves of an earthquake at a seismograph station give a clue to the distance of the epicenter of the earthquake. With several observations of this kind, it is possible to determine the point of occurrence within a very few miles. It is also possible in many cases

EARTH SATELLITE

to estimate the depth of the break, which in the average case may be about 50 km. (31.07 m.) in Europe and 18 km. (11.18 m.) in California. Some deep quakes may occur as much as several hundred miles below the surface.

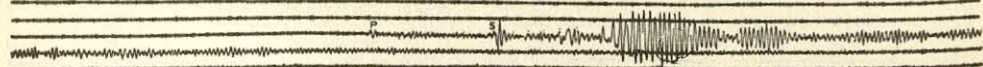
It is estimated that, for the entire land and water surface of the earth, earthquakes occur at the rate of at least 1,000,000 a year. Most of these are so light as to be barely perceptible, or they take place in uninhabited land or water areas and attract little public attention. There are perhaps 100 serious disturbances a year. (*Accompanying diagram* © *The New York Times*.)

Some of the more noteworthy earthquakes in the U.S. follow: In the lower Mississippi Valley, Dec. 16, 1811; at Charleston, S.C., in 1886; and at San Francisco, Calif., and its immediate vicinity on April 18, 1906. At the time of the latter, a large part of San Francisco, many buildings of Stanford Univ., and much property in adjacent towns were destroyed, but the destruction in San Francisco was mainly by the resulting fire. Over 100 persons were killed and several thousand injured in a quake in Southern California in 1933; and the San Francisco Bay area was hit in 1957, causing some damage. An earthquake in the Oregon-Washington-British Columbia area occurred on April 13, 1949, and resulted in few deaths but heavy property damage.

For notable earthquakes in other parts of the world, see *Accidents and Disasters*.

Earth Satellite (*ērth sāt'ē-līt*), an object or vehicle orbiting around the earth. The moon (*q.v.*) is a natural earth satellite (see *Satellite*).

Man-made earth satellites are propelled aloft by multi-stage rockets (see *Rocket*; *Rocketry*). After reaching an altitude where the atmospheric density is negligible (see *Astronautics*), the last stage of the rocket gives the satellite a velocity of ca. 18,000 m.p.h. approximately parallel to the earth's surface. The rocket then separates from the satellite. The satellite continues on its own momentum in an elliptic or approximately circular orbit with the center of the earth at the focus, or center. If the orbital path of the satellite lies completely outside the earth's atmosphere, the satellite remains aloft indefinitely, because the gravitational attraction of the earth is exactly balanced by the centrifugal force of the satellite's revolution around the earth. If part or all of the path of the satellite lies within the denser part of the earth's atmospheric envelope (*i.e.*, an altitude of perhaps 100 m.), air friction gradually slows down the satellite, which eventually spirals inward to the earth. In such a case, the satellite is



SEISMOGRAPHIC RECORD, NEW HEBRIDES EARTHQUAKE, 1925

EARTH SATELLITES IN ORBIT, AS OF NOV. 1, 1962¹

Name	Date Launched	Estimated Life (in years)	Weight (lb.)	Period (min.)	Perigee (miles)	Apogee (miles)	Remarks
1958				LAUNCHED BY U.S.²			
Explorer I	Jan. 31	7-10	30.8	105.5	217	1,092	First U.S. earth satellite; discovered Van Allen belt
Vanguard I	March 17	200-1,000	3.25	133.8	404	2,448	Still transmitting
1959							
Vanguard II	Feb. 17	100-250	20.7	125.3	354	2,037	Carried two infrared cells to observe the earth's cloud cover, not transmitting
Vanguard III	Sept. 18	50-150	100	129.8	317	2,320	Surveyed earth's magnetic field; located lower edge of Van Allen belt; and counted micrometeors
Explorer VII	Oct. 13	30-40	91.5	101.1	344	669	Still transmitting
1960							
Tiros I	April 1	50-100	270	99.1	429	467	First weather satellite
Transit IB	April 13	5	265	94.4	299	407	First navigation satellite
Midas I	April 24	8-15	5,000	94.3	264	317	Experimental military satellite
Midas II	May 2	50-200	223	101.6	389	649	Navigation satellite
NRL Solar Radiation Satellite I	June 22	50-200	40	101.6	381	657	Launched together with Transit IIA
Explorer IX	Aug. 12	2-16	132	116.5	473	1,224	Positive communications satellite; 100-ft.-diameter balloon
Courier B	Oct. 4	200-500	500	106.9	599	755	Active communications satellite; records, then repeats
Explorer VIII	Nov. 3	20-50	90	112.5	262	1,410	Took ionosphere data for communications; not transmitting
Tiros II	Nov. 23	200-500	280	98.2	378	461	Weather satellite
1961							
Samos II	Jan. 31		4,100	94.9	295	340	Experimental reconnaissance satellite
Explorer X	Feb. 16		15	118.1	466	1,524	"Polka-dot" balloon, 12-ft. diameter
Explorer XI	March 25		78	5,012.0	110	112,500	Measured magnetic fields; current position uncertain
Explorer XII	April 27		82	107.8	302	1,108	Measures gamma rays of stellar origin
Transit IXA	June 29		175	103.8	547	620	Navigation satellite, launched with Greb and Injun
Greb III	June 29		55	103.8	548	619	Greb and Injun failed to separate from each other after 3-in-1 launch with Transit IVA
Injun	July 12		40	100.3	457	511	Weather satellite, transmitting cloud cover photos
Tiros III	July 12		285	161.5	2,084	2,197	Infrared early warning satellite
Midas III	Aug. 15		3,500	161.5	2,084	2,197	Studies energetic particles and Van Allen belts
Explorer XII	Aug. 15		83	1,593.0	284	47,952	Early-warning military satellite, in about circular orbit
Midas IV	Oct. 31		3,500	172.0	2100	582	Navigation satellite which carries a Traac piggyback satellite to test gravity stabilization
Transit IVB	Nov. 15		200	106.0	528	679	Launched piggy-back on Transit IVB
Traac	Nov. 15		200	105.6	602	679	
1962							
Tiros IV	Feb. 8	No official estimates available	285	100.3	439	526	
Orbiting Solar Observatory	March 7		440	95.9	342	365	Carries 13 experiments
Ariel	April 26		132	100.8	246	744	British U.S. satellite
Tiros V	June 19		285	100.5	374	597	Weather satellite
Tehtar I	July 10		170	157.7	589	3,307	Communications satellite
Tiros VI	Sept. 18		281	98.7	423	445	Weather satellite
Alouette	Sept. 29		320	105.5	624	639	Built by Canada, launched by U.S. in polar orbit
Explorer XIV	Sept. 29		89	2,185.0	175	60,897	Studies charged particles, solar phenomena, magnetic fields
Explorer XV	Oct. 2		98	315.5	223	12,600	Studies man-made radiation
1962				LAUNCHED BY THE U.S.R.			
Comos II	April 6		No weights announced	98.8	121	735	Second of series of U.S.S.R. space environment research satellites
Comos III	April 24			89.2	120	177	Studies weather, communications, radiation
Comos V	May 8			99.2	130	777	
Comos VIII	May 18			99.2	130	777	
Comos IX	Sept. 18			90.7	139	349	
Comos X	Sept. 27			90.7	139	349	
Comos XI	Oct. 16			90.2	138	230	A series of satellites for space environmental research
Comos XII	Oct. 20			96.1	152	572	

¹ See article on Astronautics for six space vehicles in orbit around the sun.

² In addition, 7 satellites launched by the U.S. Air Force in 1962 were in orbit as of Nov. 1, 1962. Their weights and functions were not announced; their periods ranged from ca. 91 to 153 min.



VANGUARD I

This cutaway drawing shows the components of Vanguard I, the second U.S. satellite to be placed in orbit. Kerosene and liquid oxygen fueled the first-stage motor, white fuming nitric acid and unsymmetrical dimethyl hydrazine, the second. The third-stage rocket used a solid propellant.

destroyed like a meteor (*q.v.*), before reaching the surface of the earth, by the high temperature generated by air friction as the satellite hurtles through the dense layers of the lower atmosphere. The heavier a satellite, the longer it remains aloft in an orbit of given altitude, because a heavier satellite has greater momentum to resist air drag.

As of Nov. 1, 1962, 128 artificial earth satellites had been launched since the U.S.S.R. Sputnik was sent up on Oct. 4, 1957, not including planetary probes. Of these, 103 were U.S. satellites, and 25 were Russian. The accompanying table gives the data on 49 of the satellites which were still in orbit on Nov. 1, 1962. Ten of them, all launched by the U.S., were still transmitting on that date.

In addition, there were over 200 other artificial objects orbiting the earth, consisting of nose cones, rocket boosters, and other pieces which were used to launch the satellites and which remained in miscellaneous earth orbits. Not all of these objects could be tracked.

Some satellites carry battery-operated or solar-cell-powered radio transmitters to permit the

satellites to be located and tracked while in orbit. Minitrack and Microlock¹ are special U.S. radio tracking systems for satellites. In addition, satellites are tracked visually and photographically by specially designed and constructed precision cameras of very wide aperture, using a modified Schmidt optical system. Tracking is done also by large radio telescopes in the U.S. and abroad.

The purpose of man-made satellites is to make scientific observations of the upper atmosphere and of space, to increase man's knowledge of the earth and its environment, and to obtain technical data about environmental conditions in space as a prelude to further space travel. The early U.S. satellite programs were coordinated with the worldwide scientific efforts of the International Geophysical Year (*q.v.*).

Earth satellites carry scientific observing instruments which make measurements, collect data, and automatically radio (telemeter) the results to the ground. Phenomena studied by these satellite instruments include: solar radiations, including ultraviolet rays and X-rays; cosmic rays; strength and direction of the earth's magnetic field in space; temperature, density, composition, and ionization of the upper atmosphere; number and size of meteorites; albedo (reflectivity) of the earth; and amount of cloud cover on the earth. In addition, the shape of the earth can now be determined more accurately than heretofore by observing the perturbations of satellite orbits due to the fact that the earth is not a perfect sphere. Satellite data indicate that the earth is slightly pear-shaped (see *Earth*).

Observations of the motions of satellites in orbit have disclosed that the air density at altitudes of 200 m. to 300 m. is ten times greater than previously computed. Another more dramatic result of satellite experiments is the discovery of a zone of intense radiation around the earth, beginning at an altitude of 250 m. and extending to a distance of several earth's radii. This radiation, discovered by James A. Van Allen (*q.v.*), probably consists of plasma particles trapped by the earth's magnetic field. This and allied phenomena were investigated by the U.S. in 1958 under Project Argus, an experiment in which a nuclear explosion was set off at a very high altitude to determine the effects upon ionization of the atmosphere.

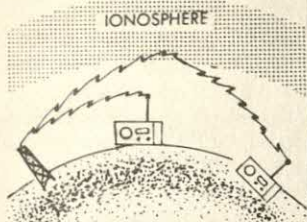
The utility of earth satellites for worldwide communications was demonstrated in December 1958 by Project Score. This was a satellite carry-

¹ Minitrack is a precision radio tracking system developed for use in the U.S.-I.G.Y. satellite program. Microlock is a radio instrumentation system which was added to Explorer satellites because it met certain telemetry requirements. Both Minitrack and Microlock receiving equipment are capable of using Microlock signals for tracking purposes.

U.S. SATELLITES FOR COMMUNICATIONS

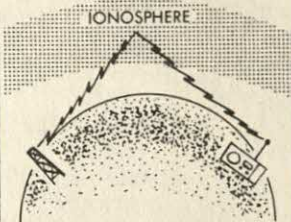
HOW RADIO SIGNALS TRAVEL

BROADCAST BAND



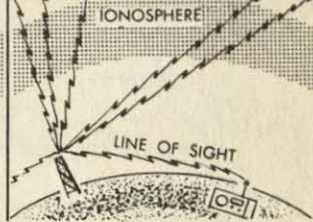
At these frequencies (550-1500 kilocycles) waves curve around earth as far as 150 miles by day. At night signals may bounce off ionosphere, electrically charged atmospheric layers 50-500 miles up, and carry as far as 750 miles.

SHORT WAVE



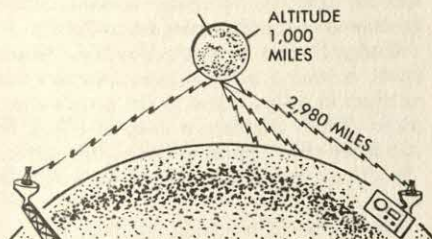
These waves (3 to 30 megacycles) are bounced back from higher in ionosphere, travel about 2,500 miles in one bounce, farther in repeated bounces. But ionosphere is unreliable reflector and signals often fade.

VHF AND UHF

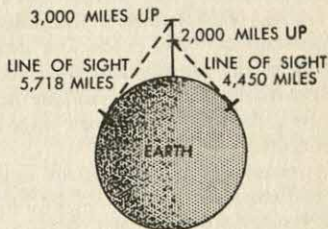


Very-high (30-300 megacycles) and ultra-high (300-3,000 mc.) frequency waves travel in straight lines and do not bounce. These frequencies (used for TV, telephone-relay, etc.) are good only for line-of-sight transmission.

BOUNCING SIGNALS OFF A 'BALLOON'



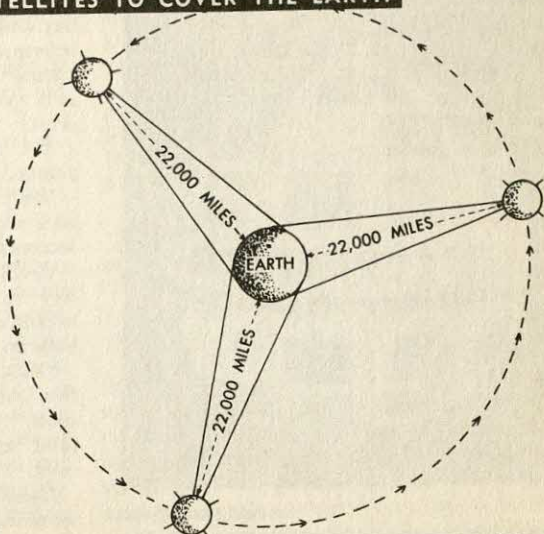
Because short-wave bands are crowded as well as unreliable, National Aeronautics and Space Administration hopes to use satellite for long-range transmission of military, telephone-relay and possibly TV signals. A 100-foot plastic balloon is to be orbited 1,000 miles up. Signals aimed at

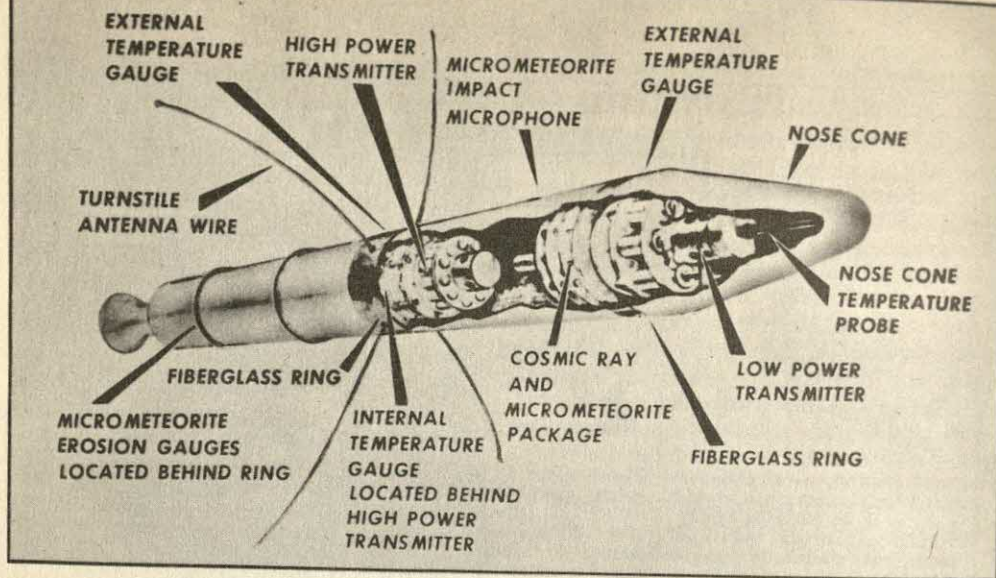


balloon would hit it and be bounced back to earth—more reliably than by the ionosphere. At higher altitudes balloon would provide even more range, as shown at right. Plan is eventually to get continuous communications with twelve satellites orbiting at 3,000 miles above earth.

'HOVERING' SATELLITES TO COVER THE EARTH

A more "sophisticated" project is planned, which would make it possible to blanket the entire earth with a simultaneous signal. Three satellites would be orbited at 22,000 miles, evenly spaced above equator. At that height the velocity of a satellite in orbit is such that its period of rotation is the same as that of the earth—and thus each satellite would "hover" over a spot on the earth just below it. A signal bounced off one such satellite would cover a large portion of the earth. And if the signal were bounced from one satellite to the others and thence back to earth, simultaneous round-the-world reception would be possible.





CUTAWAY DRAWING OF EXPLORER 1

Recording and transmitting instruments fill the orbiting section of the first U.S. satellite

ing a communication relay station to which President Dwight D. Eisenhower transmitted a Christmas message of world peace. The message was recorded in the satellite and then retransmitted automatically from the satellite to all nations of the globe—the first human voice to be heard from space.

A highly successful communications satellite, Telstar I, was sent aloft by the U.S. on July 10, 1962. This was an active repeater satellite built by the American Telephone and Telegraph Co. and launched by N.A.S.A. It relayed voice, facsimile photographs, and television programs across the Atlantic Ocean. Another active communications satellite, called Relay, was launched by the

U.S. on Dec. 13, 1962, but its communications functions were, at first, not successful.

Under Project Syncom, the U.S. planned to establish several active repeater communications satellites in 24-hr. orbits in the earth's equatorial plane. These satellites would, in effect, remain stationary with respect to the earth's surface (see "hovering" satellites in accompanying illustration).

Six weather observation satellites, called Tiros, were launched successfully by the U.S. between April 1960 and Sept. 18, 1962. These satellites transmitted televised photographs of the earth's cloud cover, in the visible portion of the spectrum and in infrared. Study of the data advances the ability to forecast worldwide weather conditions. Future U.S. weather satellite programs are Nimbus and Aeros, which are expected to provide information for continual, accurate weather forecasting throughout the world. Nimbus will be in a polar orbit, Aeros in a 24-hr. equatorial orbit.

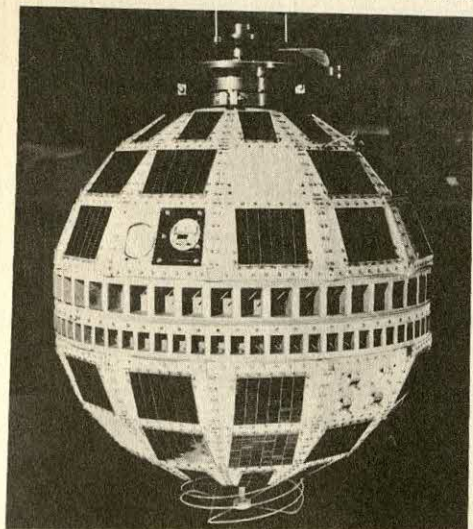
The following are N.A.S.A. earth satellites planned for scientific observations:

OSO, a series of ten orbiting solar observatories, each weighing 440 lb., the first of which was successfully launched on March 7, 1962.

OAQ, a 3,500-lb. orbiting astronomical observatory equipped with a 36-in. reflecting telescopic mirror and a spectrometer, scheduled for its first flight in 1964.

OGO, a series of ten geophysical satellites, the first scheduled for early 1964. Some of the OGO shots, called POGO, were designed for polar orbit and others, called EGO, for eccentric orbit.

DynaSoar, also designated X-20, is a delta-winged, 10,000-lb. manned orbital spacecraft being developed by the U.S. Air Force to demonstrate



AT&T Photo Service

TELSTAR, FIRST COMMUNICATIONS SATELLITE

controlled re-entry and recovery of a manned vehicle from orbit. Test drops of the X-20 from B-52 aircraft in 1963 or 1964 were expected to precede a first DynaSoar flight in 1965.

See also *Astronaut*.

Earthworm (*ērth'wūrm*), or ANGLEWORM, or FISHWORM, common everywhere except in frigid regions. Species in the U.S. are usually reddish or pinkish and 4 or 5 in. long, but may reach 10 in. An Australian species is 10 ft. long. The body is formed of hard ringlike segments alternating with soft connecting tissue, which accounts for the worm's remarkable ability to stretch or contract its length. On the segments, rows of bristles pointing backward help the earthworm to crawl. It has no tentacles, eyes, ears, or teeth. Its head is pointed; its tail rather flat. Earthworms dig burrows into which they carry decaying animal and vegetable parts, some of which they eat; the remains serve as humus. Undigested food is ejected in small heaps called worm casts. Thus the earthworm both enriches and pulverizes the soil. In addition, its burrowing loosens and aerates the soil. It is an important food for birds, fish, and insects.

Earwig (*ēr'wīg*), an order of insects allied to the cockroaches; so named in an erroneous belief that one of these insects could kill a person by creeping into his ears. Brownish, $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, usually found on the ground at night, they are fast runners, using their legs more often than their wings to move short distances. They do like to fly around street lights. Their rear wings are large and thin and when not in use are kept folded under the forewings, which are short and hard. Most conspicuous are the large forceps at the end of the abdomen. North America has several native species, and one of European origin is commonly found in the U.S.

Easement (*ēs'ment*), in law, the right to limited use of another's property, without any participation in the profits of it. Easements are of two types—easements in gross and servitudes. An easement in gross is a privilege attached to the person, such as the right of way over another's land. A servitude or easement appurtenant, as it is called, is a right fixed to an estate.

East (*ēst*), the cardinal point of the compass at the extreme right when the needle points north. More properly, the point at which the sun rises at the equinox, including the part of the horizon about that point. In the Eastern Church and the Church of England the principle of orientation (from *orient*, meaning *east*), in which both prayers and sacred objects are pointed toward the east, is observed as in the Mohammedan and Jewish religions. This practice derives from the fact that Jerusalem, focal point of these religions, is east of Europe.

East Anglia (*āng'glī-ā*), an Anglo-Saxon kingdom formed early in the sixth century A.D. between the River Stour and the Wash, on England's east coast. It was made up of the North Folk and the South Folk, whose names survive in the present counties of Norfolk and Suffolk. In 617, when Raedwald defeated Æthelfrith of Mercia, East Anglia began to take a commanding position in England. But within a few years it became subject to Penda of Mercia. In 655 Æthelhere of East Anglia, with Penda, died fighting against the king of Northumbria. After this little is known of East Anglia until 792, when Offa of Mercia conquered it. In 825 it threw off the Mercian yoke and accepted the suzerainty of Egbert of Wessex. The country was overrun by the Danes in 870, under Edmund (855-70), its last king, and eventually became a part of united England.

East Cape (*kāp*), the most easterly headland in Asia, extending into Bering Strait, in the Khabarovsk territory of Siberia, Russian S.F.S.R. Since 1898 its official Russian name has been Cape Dezhnev, after the Russian navigator who first reached there (1648). The name East Cape is also applied to the southeastern extremity of New Guinea; the eastern headlands of North Island, New Zealand; and the easternmost point of the island of Madagascar.

Eastchester (*ēst'chēs-tēr*), a town in Westchester County, southeastern New York. Settled in 1664, it now comprises the villages of Bronxville and Tuckahoe, residential suburbs of New York City, and originally included Mt. Vernon which was chartered in 1892. Bronxville is the site of Sarah Lawrence Coll., founded in 1926. Population, 1960, 33,613.

East Chicago (*shi-kā'gō*), a city of Lake County, Indiana, on Lake Michigan, ca. 17 m. s.e. of Chicago. One of the largest ports in the state, it is also served by the Pennsylvania, Baltimore & Ohio, and other railroads. Important industries include steel, railway equipment, chemicals, petroleum products, lead, and zinc. Settled in 1888, East Chicago was incorporated in the following year. Population, 1960, 57,669.

East China Sea. See *China Sea*.

East Cleveland (*klēv'land*), a city in northeastern Ohio, in Cuyahoga County; ca. 3 m. N.E. of Cleveland, of which it is a residential suburb. Incorporated as a village in 1895, it became a city in 1911. Population, 1950, 40,047; 1960, 37,991.

Easter (*ēs'tēr*), the festival kept in commemoration of the resurrection of Christ. It was observed by early Christians. In spite of the connection of Easter with the Jewish Passover (*q.v.*), the meaning of each festival is entirely different. While the Jewish Passover commemorates a historical event, namely the exodus and liberation of the Jews from Egypt, the Christian Easter, com-

memorating the Resurrection (*q.v.*), is not entirely a feast of joy. The emotional connotations of the Christian Easter contain various solemn elements because the Resurrection of Christ is inseparably connected with His previous Passion (*q.v.*). Beyond the meaning of Easter in the church year, the feast has gradually developed into a general celebration of the coming Spring, especially since it ends the previous weeks of Lent (*q.v.*). Thus, as a Spring festival, the celebration of Easter has taken on various forms with different nations. Everywhere, those habits, customs, and rites which are prescribed by the Church have developed out of a fusion of earlier pagan ceremonies with Christian contents.

Historically, the date of Easter was not exactly fixed during the first Christian centuries. It was only at the Council of Nicea (*q.v.*) in 325 that the controversial issue was settled: the first Sunday after the full moon after Mar. 21 should become Easter Sunday.

Eastern Orthodox Church (*ēs'tērn ōr'thō-dōks chŭrch*). See *Holy Orthodox Eastern Catholic Apostolic Church*.

Eastern Question (*ēs'tērn kwēs'chŭn*), in recent history, the problem relating to Turkey in Europe and the occupation of the Balkan Peninsula. It was a complicated issue of international politics for many years, but its modern phase dated from 1856, when the Congress of Paris made definite declarations upon the questions involved in the Crimean War. The war between Russia and Turkey in 1877 opened the problem anew, after which the Congress of Berlin refused to permit the former country to receive the full benefits arising from the new status created by the conflict. It was likewise influenced by the annexation of Eastern Rumelia to Bulgaria in 1885, the war between Greece and Turkey in 1897, and the establishment of autonomy in Crete. The question was again opened in 1908, when Bulgaria declared its independence and Austria-Hungary proclaimed the annexation of Bosnia and Herzegovina. Conflicts over division of the Balkans and of the Ottoman Empire contributed largely to the causes of World War I. The Sarajevo assassination, which set off the conflict, can be traced to the hostility of some of the Balkan peoples toward their Austrian masters and consequent demands for independence. The disestablishment of the Austro-Hungarian monarchy, the subsequent formation of independent nations, such as Yugoslavia, and the downfall of the Ottoman Empire at the end of the war ended what had been known as the Eastern Question.

Eastern Rumelia (*ēs'tērn rōo-mē'lī-ā*). See *Rumelia*.

Easthampton (*ēs't-hāmp'tŭn*), a town in Hampshire County, Massachusetts, 4 m. s.w. of Northampton. It is on the Boston & Maine and

the New York, New Haven & Hartford Railroads, and has a growing trade in merchandise and produce. The manufactures include yarn, rubber goods, cotton textiles, worsteds, and machinery. It is the seat of Williston Sem., a preparatory school for boys, and has a fine public library. The settlement of Easthampton dates from 1665, and it was organized as a town in 1809. Population, 1940, 10,316; in 1950, 10,694.

East Hartford (*ēs't hārt'fērd*), a town in Hartford County, Connecticut, a short distance e. of Hartford, on the New York, New Haven & Hartford R.R. It has railroad shops and manufactures of paper, tobacco, clothing, and machinery. The noteworthy buildings include a town library, the Raymond Library, and the high school. The first settlement on its site was made about 1645. Population, 1940, 18,615; in 1950, 29,933.

East India Companies (*ēs't in'dī-ā kŭm'pā-nīz*), the term used to designate companies organized in the 17th and 18th centuries for the planting of colonies and the promotion of trade. They were organized under the governments of Holland, Great Britain, Sweden, and Denmark, and were given monopolies of foreign and colonial trade within certain districts. The company operating in a specified region was granted exclusive control in the matter of government and was permitted to organize armed forces, equip natives, and build defenses for the general good. Some of the companies paid an annual tax to the home government and in return received aid and protection. After a time difficulties arose regarding territorial claims, which resulted in several wars between some countries of Europe. The first English company was granted a charter by Queen Elizabeth in 1600 for the purpose of securing East Indian trade. It was chartered as "The Governor and Company of London Merchants Trading with the East Indies." It became the most powerful body in its time, represented a large capital, and was controlled by a court of proprietors, who were large shareholders in the company. Parliament appointed a government board of control in 1784, and in 1858 made India a crown province, when the company ceased active existence, though for several years afterward it maintained an organization for the purpose of closing up its business.

In 1602 the Dutch company was organized and vied with the British until 1795 for the supremacy of the East Indian seas. The Danish company was founded in 1618 and had a varied existence until 1729, when its property interests were transferred to the state. The first French company, founded in 1664, continued operations until 1769, when its business interests were merged into the government. The Swedish company organized for the Indian trade in 1741, and reorganized on a government basis in 1806. Both the Danish and

French made their chief seat of operations on the Coromandel Coast, while the Dutch operated in Sumatra, Java, and adjacent islands, and their possessions of the Dutch East Indies date from the operation of their company. The British company settled largely in India proper, at Calcutta, in Bombay, Bengal, and Madras.

East Indies (*ēst īn'dēz*), the name applied to the region which includes the two great peninsulas of Southern Asia and the islands located from the delta of the Indus to the northern extremity of the Philippines. The appellation is made usually to distinguish these islands from the West Indies, and quite frequently includes all the islands southeast of Asia, except the Philip-



Official Netherlands Photo

EAST INDIES. BALINESE GIRLS

pine Islands and the island of New Guinea.

Eastlake (*ēst'lāk*), SIR CHARLES LOCK, painter, born in Plymouth, England, Nov. 17, 1793; died in Pisa, Italy, Dec. 24, 1865. He first attended Charterhouse in London and later studied at the Royal Acad. and in Paris. In addition to his paintings, of which "Christ Weeping Over Jerusalem" and "Beatrice" are best known, he produced a number of works on art. He became president of the Royal Acad., in 1850.

East Liverpool (*ēst līv'ēr-pōl*), a city in eastern Ohio, in Columbiana County, ca. 40 m. w. of Pittsburgh, Pa., on the Ohio River, served by the Pennsylvania R.R. Located in a farming region which also produces fire clay and shale, it is a commercial center specializing in the manufacture of pottery, electrical porcelain, bricks, and

steel products. In 1958 the city had a value added by manufacture of \$8,225,000. The site was settled in 1798. First called St. Clair, then Fawcettstown, it was incorporated as East Liverpool in 1834. Population, 1950, 24,217; in 1960, 22,306.

Eastman, GEORGE, inventor and industrialist, born in Waterville, N.Y., July 12, 1854; died in Rochester, N.Y., March 14, 1932. Eastman was educated in the public schools. As an amateur photographer he developed a process for making dry photographic plates, which he began to manufacture in 1880. Four years later he produced the first commercially successful roll of film; and in 1888 he patented the first compact, hand-held camera, the original "Kodak." By 1890 Eastman had patented the first machine for making rollable transparent film, and in 1899 the Eastman Kodak Co. at Rochester, N.Y. (*q.v.*), acquired the patent for Velox photographic paper from its inventor, Leo Hendrick Baekeland (*q.v.*). As a philanthropist, Eastman gave more than \$50,000,000 to educational institutions, including the Massachusetts Inst. of Technology, Hampton Inst., and Tuskegee Inst.

Eastman, JOSEPH BARTLETT, public official, born in Katonah, N.Y., June 26, 1882; died in Washington, D.C., March 15, 1944. He was graduated from Amherst Coll. in 1904 and became counsel for employees of various street railway companies in wage arbitration cases. Beginning in 1919 he was a member of the Interstate Commerce Commission for many years and director of the Office of Defense Transportation in 1941-44.

Eastman, MAX FORRESTER, born at Canandaigua, N.Y., on Jan. 4, 1883. A graduate of Williams Coll. (1905), he instructed in philosophy at Columbia Univ. (1907-11) and organized the



MAX EASTMAN

first U.S. Men's League for Woman's Suffrage (1910). He was editor of *The Masses* (1913-17) and *The Liberator* (1918-22). Expressing great interest in the socialist movement, he visited Soviet Russia, writing commentaries on this and related subjects, including "Marx and Lenin, the Science of Revolution" (1926), "The End of Socialism in Russia" (1937), "Marxism, Is It Science?" (1940), and "Reflections on the Failure of Socialism" (1955). Translator of Leon Trotsky and editor of Karl Marx's "Capital and Other Writings" (1932), he also wrote "The Enjoyment of Poetry" (1913), "The Enjoyment of Laughter" (1936), "The Enjoyment of Living" (1948), and "Lot's Wife" (1942), a dramatic poem.

Easton (*ēs'tūn*), a city in east central Pennsylvania, seat of Northampton County, at the junction of the Delaware and Lehigh rivers, 55 m. N. of Philadelphia, served by the Lehigh Valley and other railroads. The city is the center of an agricultural area which has important deposits of cement, rock, limestone, and sand and gravel. Among its manufactures are chemicals, iron and steel machinery, printing and paper products, and textiles. It is part of the Allentown-Bethlehem-Easton, Pa.-N.J. standard metropolitan statistical area (pop., 1960, 492,168), the Pennsylvania portion of which includes all of Lehigh and Northampton counties. In 1958 the city had a value added by manufacture of \$35,281,000. Easton is the seat of Lafayette Coll. and Trinity Protestant Episcopal Cathedral. The First Reformed Church (1776) was used as a hospital in the Revolutionary War. Easton was settled ca. 1749 and incorporated as a borough in 1789 and as a city in 1887. Population, 1960, 31,955.

East Orange (*ēs't ōr'ənj*), a city in north-eastern New Jersey, adjacent to Newark, on the Delaware, Lackawanna & Western and the Erie R.R.'s. The city is primarily a suburban residential center, but has a few local industries, chiefly the manufacture of airplane parts, tools, and electrical equipment. East Orange had a value added by manufacture (1958) of \$19,245,000. It is the seat of Upsala Coll. Part of Orange until 1863, East Orange was incorporated in 1899. Population, 1950, 79,340; in 1960, 77,259.

Eastport (*ēs't pōrt*), a city and port of entry in Maine, in Washington County, 130 m. S.E. of Bangor, the easternmost settlement in the U.S. On Moose Island in Passamaquoddy Bay, it has a deep harbor from which lumber and fish are shipped. The chief industries are fishing and sardine canning. Eastport is the site of the Passamaquoddy Tidal Power Project. The site was settled in 1793. Eastport was captured in 1814 and governed by the British until 1818. It was incorporated in 1893. Population, 1950, 3,123; in 1960, 2,537.

East Providence (*ēs't prōv'i-dēns*), a city in

eastern Rhode Island, in Providence County, across the Seekonk River from Providence. Primarily a commercial and residential center, it manufactures wire, fertilizers, and paper and tar products. It is part of the Providence-Pawtucket, R.I.-Mass. S.M.S.A. (1960 pop., Rhode Island section, 731,358). The city had a value added by manufacture in 1958 of \$26,136,000. The area was settled in 1812 as part of Seekonk, Mass., from which it was separated in 1862 when the state boundaries were fixed. East Providence was incorporated as a city in 1958. Population, 1950, 35,871; in 1960, 41,955.

East Prussia (*prūsh'ā*), a former province of Prussia (*q.v.*), situated between the Vistula and Nieman rivers, with the Baltic Sea and Poland to the south and west and Lithuania to the north and east. It is a hilly country of lakes and pine forests, producing rye, oats, and potatoes; the chief industries are fishing and stock raising.

The Teutonic Order (*q.v.*) ruled East Prussia from the 13th century until 1525, when it was secularized as the duchy of Prussia. Brandenburg annexed it in 1618. After World War I, the Versailles Treaty (1919) separated East Prussia from the rest of Germany by the device of the Polish Corridor, and the Memel (*q.v.*) district was annexed by Lithuania in 1923. In World War II, Russian forces invaded East Prussia in late 1944, and by April 1945 the Red Army had conquered most of the province. At the Berlin Conference in the latter year, the northern section, including Königsberg (*q.v.*) and the adjacent area on the Baltic, was assigned to Russia and the remainder to Poland. In 1941 East Prussia's area was 14,300 sq. m., and the population, 2,333,230.

East River, a strait, mistakenly called a river, ca. 16 m. long and 600 to 4,000 ft. wide, connecting Upper New York Bay with the southwestern end of Long Island Sound. It separates New York City's boroughs of Manhattan and The Bronx on the west from Brooklyn and Queens on the east. The East River is navigable by seagoing vessels, and many docks line its lower end. It is spanned by the Triboro, Throgs Neck, Queensboro, Bronx-Whitestone, Brooklyn, Manhattan, and Williamsburg bridges, and the Queens-Midtown tunnel passes beneath it. There is also a railroad bridge at Hell's Gate. In the strait are a number of small islands, and the New York Naval Shipyard in Brooklyn is near its southern end.

East Saint Louis (*sānt lōō'is*), a city in southwestern Illinois, in St. Clair County, on the Mississippi River opposite St. Louis, Mo., with which it is connected by the Eads Bridge. A major rail terminal, it is served by the Baltimore & Ohio, the New York Central, the Missouri Pacific, and other railroads. The city is an industrial and

commercial center, its industries including meat-packing, food-processing, oil-refining, and the manufacture of alumina, bricks, chemicals, foundry and machine shop products, and paper, metal, and glass containers. It is part of the St. Louis, Mo.-Ill. standard metropolitan statistical area, the Illinois portion of which (pop., 1960, 487,198) includes Madison and St. Clair counties. In 1958 the city had a value added by manufacture of \$42,113,000. Founded in 1797 and incorporated as the village of Illinoistown in 1859, the town in 1861 became part of East St. Louis (founded two years earlier), and in 1865 it was incorporated as a city. Cahokia Mounds State Park is 8 m. to the north. Population, 1950, 82,295; in 1960, 81,712.

Eaton (*ē'tn*), AMOS, natural scientist, born in Chatham, N.Y., May 17, 1776; died in Troy, May 10, 1842. A graduate of Williams Coll. (1799), he entered the practice of law. Becoming interested in the natural sciences, particularly botany, he studied at Yale Coll. and in 1817 began a series of lectures on botany and geology in New England and New York. He was professor of natural history (1820-24) at Castleton (Vt.) Medical School and senior professor (1824-42) at Rensselaer Coll. (now Rensselaer Polytechnic Inst.). Among Eaton's published works on science is "A Manual of Botany for the Northern States" (1817).

Eaton, DORMAN BRIDGMAN, lawyer and civil service official, born in Hardwick, Vt., June 22, 1823; died in New York, N.Y., Dec. 23, 1899. He was graduated from the Univ. of Vermont (1848) and Harvard Law School (1850) and entered the practice of law. Appointed chairman of the U.S. Civil Service Commission in 1873, he was reappointed in 1883 and 1885. He drafted the Pendleton Act of 1883, which has remained the basis of the U.S. civil service system. Eaton was the author of "Civil Service in Great Britain" (1880) and "The Government of Municipalities" (1899).

Eaton, JOHN HENRY, lawyer and politician, born in Halifax, N.C., June 18, 1790; died in Washington, D.C., Nov. 17, 1856. After attending the Univ. of North Carolina, he studied law and settled in Tennessee. He married Myra Lewis, a ward of Andrew Jackson. Elected to the U.S. Senate in 1818, Eaton served until 1829, when he resigned to become Secretary of War in Jackson's administration. In the same year he married Margaret O'Neill (*q.v.*) and thus became the center of a Washington social controversy that grew out of rumors concerning his previous friendship with her. Although he was warmly supported by Jackson, Eaton was forced to resign from the cabinet in 1831. He was elected governor of Florida in 1834 and later served (1836-40) as U.S. minister to Spain.

Eaton, MARGARET O'NEILL, known as PEGGY O'NEILL, born in Washington, D.C., in 1796; died there, Nov. 8, 1879. She was the daughter of a Washington hotelkeeper and was first married to John B. Timberlake. After his death (1828), she married John H. Eaton (*q.v.*), who shortly thereafter became Secretary of War under President Jackson. Through his position she gained entree to Washington society, but reports of her relationship with Eaton before their marriage led other members of the cabinet to refuse to accept her. The resulting social feud caused President Jackson to reorganize his cabinet without Eaton, who resigned in 1831. As a result Jackson and Martin Van Buren became warm friends, but the friendship between John C. Calhoun and the President lapsed. Van Buren thus received the Democratic nomination for President in 1836, which otherwise probably would have gone to Calhoun.

Eaton, THEOPHILUS, colonist and administrator, born in Stony Stratford, England, in 1590; died in New Haven, Conn., Jan. 7, 1658. In 1637 Eaton emigrated to Massachusetts with John Davenport (1597-1670), as one of the original patentees of the Massachusetts Bay Colony. With Davenport he established the settlement of New Haven in 1638; he was elected the first governor and was re-elected successively until his death.

Eaton, WALTER PRITCHARD, author and educator, born in Malden, Mass., Aug. 24, 1878; died in Chapel Hill, N.C., Feb. 26, 1957. A graduate of Harvard Univ. (1900), he became a drama critic for the New York *Herald Tribune* in 1902. From 1933 to 1947 he served as associate professor of playwriting at Yale Univ. His published works include "The American Stage of Today" (1908), "The Man Who Found Christmas" (1913), "Plays and Players" (1916), "Queen Victoria" (1923, a play written with David Carb), and "The Drama in English" (1930).

Eau Claire (*ō klār*'), a city in western Wisconsin, seat of Eau Claire County, at the confluence of the Eau Claire and Chippewa rivers, 90 m. E. of St. Paul, Minn. It is served by the Chicago and North Western and other railroads. Eau Claire Airport is 4 m. N.N.E. of the city center. The city is located in an extensive forest region, and lumbering is one of the most important industries. Other manufactures include tires, paper, metal parts, and meat products. Dairy farming is also carried on in the area. In 1958 the city had a value added by manufacture of \$56,678,000. Though trappers and loggers had been in the vicinity as early as 1784, Eau Claire was not founded until 1827; it was incorporated as a city in 1872. It is the seat of Christ Church Protestant Episcopal Cathedral.

Population, 1940, 30,745; in 1950, 36,058; in 1960, 37,987.

Ebers (*ä'bērs*), GEORG MORITZ, Egyptologist and writer, born in Berlin, Germany, Mar. 1, 1837; died Aug. 7, 1898. After being graduated from Göttingen and Berlin, he taught at Jena, and in 1868 became professor of Egyptology at Leipzig. By making several journeys through various parts of Asia and Africa, he added much of value to the fund of knowledge in archaeology and philology. In 1873 he discovered a scroll dating from the 2d century B.C., near Thebes, now called the *Papyrus Ebers*. It is preserved at the Univ. of Leipzig. Among his best-known writings are: "Egypt and the Books of Moses," "Through Goshen to Sinai," "In the Blue Pike," "Story of My Life," "Cleopatra," "The Coptic Art," "The Sisters," and "An Egyptian Princess."

Ebert (*ä'bērt*), FRIEDRICH, President of Germany, born at Heidelberg in 1871. His father was a tailor and the son became a harness maker. In 1900 he was chosen as a socialist representative to the city council of Bremen, whence he was elected to the national Reichstag. He supported the government in the war of 1914, but opposed the plan of annexing territory. In 1918, following the revolution, he was chosen temporary President and was elected for a term of seven years in 1919. For his administration see *Germany*. He died Feb. 28, 1925.

Ebionites (*ē'bī-ō-nūts*), a Jewish-Christian sect which accepted certain principles of Christianity, though still observing the Mosaic law. They regarded Christ as being of human nature and denied the virgin birth, but otherwise accepted the Christian doctrine. This sect was important during the first two centuries A.D.; they gradually died out, vanishing at the end of the 4th century.

Ebner-Eschenbach (*äb'nēr-ēsh'ēn-bāk*), MARIE, BARONESS VON, novelist and poet, born at Castle Zdislawitz, Austria, in 1830; died in 1916. She was a countess by birth and married an Austrian officer. Her writings included: "Without Faith," "Lotti, the Watch Maker," "The Harmful," "Village and Castle Histories," "Bertran Wogelweid," and "The Old School."

Ebony (*ēb'ūn-i*), a hard, heavy wood, usually dark, susceptible of a high polish, and used in many kinds of ornamental cabinet work. In various species of trees the heartwood becomes black and is the ebony of commerce. The Ceylon ebony is, perhaps, the best known, although the West India or Jamaica ebony of the bean family, a greenish-brown product, and the green ebony of the spurge family are of importance commercially. Because jet-black ebony is free from veins, it is considered best. The different species are variously used for toys, mosaics, veneering, and inlaid work.

Ebro (*ē'brō*), the only large river in Spain that empties into the Mediterranean Sea, flowing east

by south 465 m. from its source in Santander Province to Cabo de Tortosa, Tarragona Province, and draining an area of about 31,000 sq. m. The chief cities on its banks are Logroño, Saragossa, and Tortosa, the head of navigation for ocean-going vessels. A source for irrigation since Moorish times, it is fed by 12 principal tributaries and is paralleled between Tudela and Saragossa by the Imperial Canal, begun under Emperor Charles V. In 1938, during the Spanish civil war, the Loyalists diverted the troops of Gen. Franco driving against Valencia by attacking on the Ebro front, thus temporarily checking Franco.

Ecarté (*ä-kär-tä*), a game of cards popular in France, played ordinarily by two persons, but *pool écarté* may be played by three or more. In the latter the third player and others in the game act as advisers, remaining close at hand and advising one of the players, and, when one player loses a game, his place is taken by the adviser. The object is for the player to get all the tricks, but it is necessary for him to follow suit, if possible.

Ecbatana (*ēk-bāt'ä-nä*), an ancient capital of Media, founded about 728 B.C. It was enclosed by seven concentric walls, the innermost of which was gilded and the next was plated with silver, while the others were painted in order orange, blue, scarlet, black, and white, respectively. They rose in graduation toward the center, hence could all be seen at once by a spectator occupying an advantageous point. On a conical hill stood the beautiful temple of the sun. The city was about 30 m. in circumference during its prosperity. It was captured by Cyrus in 549 B.C. and later by Darius, who found there the edict of Cyrus the Great concerning the rebuilding of the Temple of Jerusalem. Alexander the Great conquered it while on his famous Asiatic expedition. On account of its beautiful surroundings and mild climate it was made the summer residence of first the Median, second the Persian, and lastly the Parthian monarchs. It was pillaged by the Seleucidae and later by Antiochus the Great, and fell into utter decay, so that its exact site can no longer be fixed with certainty, though historians generally agree that the present Hamadan, containing the supposed tombs of Mordecai and Esther, occupies its ancient site.

Eccentric (*ēk-sēn'trīk*), a contrivance in mechanics for securing reciprocating rectilinear motion from a revolving shaft. It consists of a disk fixed on the axis or center of a wheel, which does not pass through the center of the other disk. Not being in the center, the result of its revolution is the same as a crank. It is used chiefly in machinery where a subsidiary motion of small power is required, as in operating the slide valves of steam engines and in working the force pumps of steam boilers.

Eccles (*ē'kēlz*), MARRINER STODDARD, chairman

of the Board of Governors, Federal Reserve System, born in Logan, Utah, Sept. 9, 1890. Educated at Brigham Young Univ., he began his business career in his father's lumber mills. Under



MARRINER S. ECCLES

his direction the Eccles Investment Co. was formed in 1916 and acquired control of banking firms in Utah, Wyoming, and Idaho. By 1927 he was president of the First Security Corp. Coming into the government in the first days of the New Deal, Eccles soon became head of the Federal Reserve Board, a post he held until 1948, when President Truman moved him to the vice chairmanship, from which he resigned in 1951. He published "Beckoning Frontiers: Public and Personal Recollections" (1951).

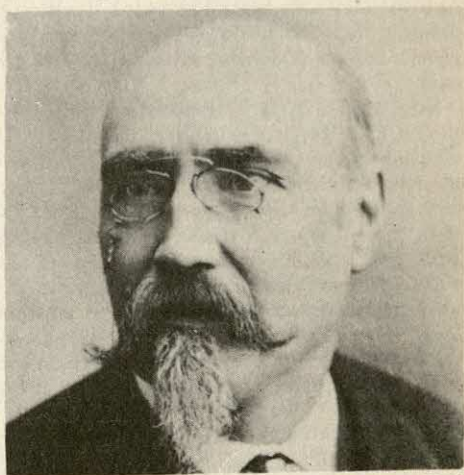
Ecclesia (*ĕk-klē-zī-à*), a popular assembly of the people, especially of Athens, to discuss public affairs. According to the laws of Solon these assemblages were held four times every 35 days, unless special meetings were called, when messengers were sent to summon the people from the country. Every citizen 20 years of age could vote and was required to attend under penalty of a fine. The poorer classes were paid a small sum for attendance. The meeting usually began by prayer to the gods, after which the business was introduced. Any regularly convened assembly came to be called *ecclesia*, and the name was afterward applied to the Church by the New Testament writers.

Ecclesiastes (*ĕk-klē-zī-ās-tēs*), one of the canonical books of the Old Testament, commonly called the *Preacher* in the English versions. In the Hebrew it is called *Kohleth*, meaning the gatherer of the people. It is generally ascribed to the authorship of Solomon, but modern criticism places it at a much later date.

Ecclesiasticus (*ĕk-klē-zī-ās-tī-kūs*), a book

of the Apocrypha, commonly called the *Wisdom of Jesus the Son of Sirach*. The Jews and Protestants accept it as an apocryphal writing, but the Roman and Greek churches class it as canonical. It is recommended to be read for edification by the Articles of the Anglican Church. This book appears to have been written in Hebrew at Jerusalem about 250 B.C. It contains rules rather than principles for living, admonishes man to honor the law, and approves of the righteous life for the happiness that it brings.

Echegaray (*ĕ'chā-gā-rī*), JOSÉ, dramatist, born in Madrid, Spain, Apr. 4, 1832; died Sept. 14, 1916. He first studied mathematics and mechanics, but later took up finance and political economy. In 1868 he became deputy to the Cortes Government, and later was made minister of public instruction (1873), and of finance (1874, 1905). From 1874 he devoted his time to writing. His first play, "The Avenger's Bride" (1874), was highly successful and was considered a milestone in Spanish drama. Within a few years he



Courtesy Brown Bros., N. Y.

JOSÉ ECHEGARAY

had written more than 60 plays. His experience as a sociologist and statesman formed the background for much of Echegaray's work, and in 1904 (with Frédéric Mistral) he received the Nobel Prize for Literature for his "brilliant and comprehensive literary activity, which has, in an independent and original way, reanimated the great traditions of Spanish drama."

Echidna (*ĕ-kid'nā*), a genus of toothless mammals native to Australia. These animals have a long, slender muzzle, toothless jaws, long, thick fur intermingled with sharp spines, and feet provided with powerful claws. When frightened or in danger, they curl up like the hedgehog to protect the under parts, which have no spines. They are closely allied to the duckbill and, like it,

propagate by eggs. The food consists chiefly of ants and other insects, for which they burrow in the earth. The body is from a foot to 18 in. long and somewhat broad and depressed, and the movement is quite rapid, considering the shortness of the legs. They lie dormant during the seasons of drought and come out most frequently at night. Their flesh is prized as food by the Papuans and other natives.

Echinodermata (*ê-kî'nô-dêr'mâ-tâ*), one of the grand divisions into which the animal kingdom is divided. It constitutes an independent assemblage of organisms, formerly classed as radiates with the Coelenterates, and ranks as the third from the lowest of the divisions of the animal kingdom. The five parts of their body radiate from a central axis, hence the former classification, and their external skeleton is calcareous, which is leathery in some species and in others is covered with spines. The alimentary canal is distinct from the body cavity and is protected by the skeleton, and the nervous system is radiate. Reproduction is by eggs. The young are greatly different from the adult, especially in that they are bilaterally symmetrical, instead of having the radiate structure.

Some species of the Echinodermata effect locomotion by a peculiar water vascular system, by which the water is carried to a system of locomotor tube feet, or *ambulacra*, these being thrust outward and forward to produce movement. In some of the larvae movement is effected by long arms, which are stiffened by slender rods of carbonate of lime. These arms are absorbed at the time metamorphosis takes place. The sense of touch is well developed, but only traces of pigment eyes and of the blood system are found in some of the species, while in others they appear to be entirely absent. All the species, of which there are about 3,000 now living, are marine and are distributed through all seasons. Seven divisions have been made of the echinodermata, depending upon the form of the body. They include the sea cucumbers, sea urchins, brittle stars, starfishes, cystoids, and pentremites. See *Starfish*; *Urchin*.

Echo (*êk'ô*), in Greek mythology, one of the Oreads or mountain nymphs, daughter of the earth and air. It is related that Echo fell in love with Narcissus, who was deaf to her entreaties. In her grief she wasted away until nothing remained but her bones and her voice. Later she was avenged by Nemesis, who inspired Narcissus with a love for himself. Many poets have used the story as a basis for exquisite productions.

Echo, a Greek word meaning sound, signifying the repetition of a sound wave reflected from some obstacle. When the reflecting surface is at right angles, the sound waves are returned to the person or object causing them, but, if

oblique, the echo is sent in another direction and may be perceived in some other locality than the one from which the waves were induced. No absolute law can be laid down for the exact distance the reflecting object must be from the speaker. Sound at 60° F. has a velocity through air of 1,120 ft. per second. If in ordinary speech five syllables are uttered in a second, then the speaker, standing in front of a reflecting surface 112 ft. distant, can hear the last syllable. The other syllables are reflected, but reach the speaker just as he begins the next syllable, hence he does not hear them as distinct sounds. A sharp, quick sound may be heard 56 ft. distant. In a properly constructed hall the voice of the speaker is strengthened in effect by the waves reflected by the walls and ceiling. If the walls are too close or too far the sound is confusing. Natural echoes are produced by woods, hills, rocks, and mountains, and many localities have become famous on account of them. Some echoes are repeated a number of times. It is said that the report of a pistol is repeated 60 times by an echo in the Simonetta Palace, near Milan, Italy. Lake Killarney, in Ireland, is noted for its echo, which belongs to this class. See *Sound*.

Eck (*êk*), JOHANNES MAYER VON, German theologian, born at Eck, Swabia, Germany, 1486; died 1543, Ingolstadt, Upper Bavaria. One of the greatest theologians of his time, Eck became a professor at the Univ. of Ingolstadt and achieved fame not only for his scholarly knowledge but especially for his talent for disputation and discussion. Because of his special gift, he was employed by the Roman Catholic Church to dispute with Martin Luther (*q.v.*) the theses the latter had laid at the door of the Church of Wittenberg (see *Reformation*). Out of this discussion grew Eck's main work, "*De primatu Petri*," emphasizing the superior position of the Pope. This work became one of the main motives in the Pope's direction of the famous bull, "*Exsurge Domini*," against Luther. From that point on, 1520, Eck, as the leading personality in the fight against Luther, suffered considerably from the Protestant governments of the individual states and had to flee from Saxony. However, he continued in his fight against the reformers, and went on publishing works directed against them. Since Luther did not answer his arguments, Eck later on especially turned his attacks on the Swiss reformer, Zwingli (*q.v.*). There was hardly one German diet between 1522 and Eck's death in 1543 where Eck was not present to fight against the reformers with his scholastic disputations.

Eckener (*êk'en-êr*), HUGO, aviator, born at Flensburg, Germany, Aug. 10, 1868; died at Friedrichshafen, Aug. 14, 1954. He studied in his native city and several German universities, specializing in engineering, and became in-



HUGO ECKENER

terested in aviation. For many years he was associated with Count von Zeppelin at the great aviation works at Friedrichshafen, on Lake Constance. In 1924 he brought the ZR-3, afterward renamed the *Los Angeles*, to America. He made the first commercial round-trip flight between Europe and America in 1928, carrying 20 passengers, a crew of 40, and large consignments of mail and freight. In the same year he made a successful flight to the Mediterranean countries of Africa, Asia, and Europe. His achievements in 1929, besides his second trip to New York, included the first commercial flight around the earth, with stops at Friedrichshafen, Tokyo, Los Angeles, and Lakehurst, N.J. He started on his world trip from Lakehurst on Aug. 8, 1929, and returned there on Aug. 28. Before 1936 he crossed the Atlantic more than 100 times, and meanwhile completed and successfully operated the great *Von Hindenburg*, mostly on American tours. In 1936, he was awarded the British Gold Medal for Aeronautics, a year later the Guggenheim Medal. He published a life of Zeppelin in 1938. In 1947 he came to the U.S. to work for the Goodyear Corp.

Eckhart (ĕk'härt) OF ECKART or ECKEHART, usually called MEISTER (German, meaning master) ECKHART, mystic, born in Hochheim, Germany, ca. 1260; died in Cologne, ca. 1327. He studied philosophy and theology at the Univ. of Paris, then joined the Dominican order and became magister in theology in Paris (1302), provincial of his order in Saxony (1303-11), and vicar general of Bohemia (1307 ff.). In later years he taught in Paris, Strasbourg, and Cologne. Because of his leaning towards pantheism (*q.v.*), he was accused of heresy in 1327 but demonstrated his orthodoxy. However, after his death 28 of his propositions were condemned as heretical. Influenced by Neo-Platonism and scholasticism, and also by Arab and Jewish philosophy,

he became the founder of German mysticism.

Eckstein (ĕk'stĭn), GUSTAV, physiologist and author, born in Cincinnati, Ohio, Oct. 26, 1890. After studying for a career in dentistry, he decided to study medicine instead, receiving his medical degree in 1924. Remaining at the Univ. of Cincinnati School of Medicine as an instructor of physiology, Eckstein soon began to write on medical subjects, first appearing in print in 1926. During his student days he made three trips to Japan, and the knowledge of Japanese culture he acquired furnished material for three of his later books. The first of these, "Noguchi" (1931), was the story of the Japanese scientist of that name who, as an immigrant to the U.S., did important research on yellow fever. Eckstein turned to physiology in his second book, "Lives" (1932), which was an unusual account of the lives of rats, canaries, and cockroaches. This was followed by "Kettle" (1933), his first fiction work, and "Hokusai," in 1935, the year he was made associate professor at the Univ. of Cincinnati. His later works include "Canary" (1936), "Christmas Eve" (1940), "In Peace Japan Breeds War" (1943), "The Pet Shop" (1945), and "Everyday Miracle" (1948).

Eclampsia (ĕk-lămp'sĭ-ă), an attack of convulsions, especially convulsions in women in the late phase of pregnancy. *Uremic eclampsia* refers to convulsions caused by uremia (poisoning of the system by an excess of body waste products resulting from the suppression of urination, by which these waste products are normally excreted). *Eclampsia of pregnancy* is a well-known condition in which during later pregnancy there sometimes develops a syndrome of abnormally rapid weight gain caused by excessive retention of fluids in the body tissues, producing swelling of the extremities and face, hypertension (especially diastolic), albuminuria (protein substances, mostly albumin, excreted in excessive quantities in the urine), dizziness, headaches, frequent visual disturbances, anxiety, and convulsions. Modern obstetrics divides this condition into three classes called the toxemias of pregnancy: mild pre-eclampsia, severe pre-eclampsia, and eclampsia, according to the severity of the physical findings. If convulsions occur, the condition is called *eclampsia gravidarum*, or *true eclampsia*; however, this formerly frequently fatal condition rarely occurs now because of modern improvements in prenatal observation and care.

There are many theories regarding the cause of eclampsia, including predilection of certain races, certain climates, abnormal metabolic products, and endocrine abnormalities. Recent research suggests degeneration of the maternal side of the placenta (afterbirth) with release of toxic substances into the maternal system, with accompanying endocrine imbalance and especially

deficiency of the hormones necessary for the normal development and termination of pregnancy, with a combined effect on the maternal system of generalized vascular damage and fluid balance upset, as the basis for the toxemias of pregnancy. The severe state is usually avoided by bed rest, sedation, and restrictions on diet, fluids, and salt intake after the first signs and symptoms are noted. Usually the condition, if severe, is immediately alleviated by death of the fetus in utero, or by delivery of the living child, with return of the mother to her normal state of health.

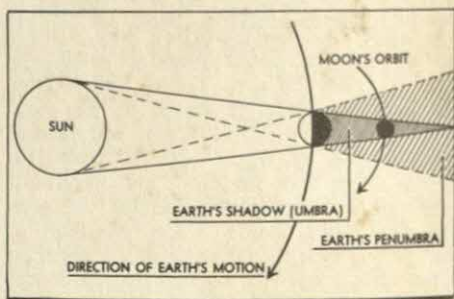
Eclectics (*ē-ĕk'ŭks*), a class of philosophers who selected or chose from others what they considered the best parts of all the recognized systems. As a school of philosophy eclecticism necessarily had its rise after other systems had been established, since it chose what was thought the best and harmonized it into a new system. Since both Plato and Aristotle drew from the philosophies of those who preceded them, they may be regarded as eclectics in a certain sense. However, those belonging more particularly to this class include Plutarch, Plotinus, and Epictetus. Victor Cousin, the French writer on the history of philosophy, is the most eminent modern eclectic.

Eclectic School of Medicine, the school of medicine which relies upon treating patients as thought advisable by the physician rather than following the instruction of schools. It is an American system and is known also as the New School of Medicine, though it may more properly be said to be the modern representative of a system of healing that dates from the year 200 B.C. The eclectic practitioner is not an absolute individual; rather, he relies upon his judgment while at the same time he keeps in mind what has been previously learned in the art of healing. Wooster Beach founded an eclectic college in New York City in 1826; the modern eclectic school of medicine thus dates from the early part of the 19th century. He published a number of textbooks and founded several colleges. In 1870 the National Eclectic Medical Assn. was incorporated in New York and since then other similar associations of the same kind have been organized. Although common medicines are used by this school, in theory it does not favor the employment of mineral substances and is an advocate of using native plants that possess medicinal properties. This position in relation to plants has been the means of obtaining much information regarding American plants useful in the treatment of diseases. Generally speaking, the resources of the eclectic school of medicine are sought for in the realm of nature rather than in the realm of synthetic chemical products and drugs. Water, sun, exercise, and other so-called "natural factors" are relied on, thus incorporating some of the methods of so-called "physiotherapy." After World War I,

official schools of medicine also began to utilize these factors, thus materially reducing the difference between the more individualistic eclectic school of medicine and the official school.

Eclipse (*ē-kīps*), an obscuration, partial or total, of a heavenly body by its entering the shadow of another body, as when the moon enters the shadow of the earth, or a satellite that of a planet. An eclipse may occur by the partial or total disappearance of the sun as the effect of the passage of the moon between it and an observer. Stars, planets, and the satellites of planets may be eclipsed, but the principal eclipses are those of the sun and moon. An eclipse of the sun begins by an obscuration of the western side of the disk and ends on the eastern, while an eclipse of the moon begins on the eastern and ends on the western side.

SOLAR. When the sun and moon are in conjunction at the time of new moon, the moon is necessarily between the earth and the sun, the three bodies being in a straight line, as shown in Fig. 2. This causes an eclipse of the sun. If the moon's orbit were circular and in the same plane as the ecliptic, an eclipse of the sun would occur at every new moon; but, since the orbit is inclined, an obscuration can occur only at or near a node. If at eclipse time the moon is nearest to the earth (perigee) its shadow sweeps over the earth's surface along a band that can reach a



ECLIPSES

width of 180 m. In that area occurs a *total eclipse* of the sun, which can last as long as 7.6 minutes. At other times when the moon is not so close to the earth the zone of totality is narrower. When the moon is farthest away (apogee, *q.v.*) at eclipse time the apex of the cone of shadow does not reach the earth's surface, so that the sun is nowhere completely covered; along the central line the sun then appears for a short time as a luminous ring; this is called an *annular eclipse*. Seen from points outside the central zone, only a portion of the sun will be covered by the moon; this is called a *partial eclipse*.

LUNAR. Eclipses of the moon are caused by the moon's passing through the earth's shadow, as illustrated. They can occur only at full moon.



AMERICAN COSTUMES

In the days of the Pilgrims
(top row)

At the end of the Eighteenth Century
(bottom row)



AMERICAN COSTUMES
At the turn of the Century

The moon does not disappear completely even in a total eclipse, because of the refraction of the solar rays in traversing the lower strata of the earth's atmosphere. Since a *penumbra* surrounds the shadow of the earth, it sometimes occurs that the moon does not reach the true shadow, passing only partly within the penumbra. There never can be an annular eclipse of the moon, for the reason that the earth's shadow exceeds in diameter the moon's disk. Total eclipses of the moon are rarer events than those of the sun, yet are seen more frequently, for the reason that they are visible over the entire unilluminated hemisphere of the earth, and also because of the long duration of the eclipse, which may last for several hours.

Total solar eclipses at any given point on the earth's surface are exceedingly rare; before 1715 none had been visible at Paris, France, for five and a half centuries. In ancient times people were very much frightened during eclipses, and thought them presages of dire events. All manner of frantic efforts were made to drive them away. At one time the laws of Rome made it punishable blasphemy to talk publicly of their being due to natural causes.

OTHER ECLIPSES. The moons of other planets produce eclipses similar to those that are due to our moon—Jupiter being a large planet with a whole family of satellites, eclipses are very frequent in that system; the apparent irregularities in the time of their recurrence were explained by the Danish astronomer Roemer (1675) as due to the finite velocity of transmission of the light; this enabled him to make the first determination of that important physical constant.

In some double stars the two components revolving around each other are sometimes so close together and so oriented that periodically one body partially or wholly covers the other. This produces the so-called *eclipsing variable stars*, of which Algol is the best known.

Ecliptic (*ē-kli'p'tic*), the apparent yearly path of the sun around the celestial sphere. It was so called by the Greeks for the reason that they observed that eclipses of the sun and moon can occur only when these bodies are near this circle. The earth's axis is not perpendicular to the plane in which the sun appears to move, but is inclined $23\frac{1}{2}^\circ$. If the stars could be observed in the daytime, the sun would be seen to be moving slowly among them toward the east, just as the moon does at night; this path is the *ecliptic*. Now, if the earth's Equator is imagined to be extended as a great circle into the heavens immediately above its true position, it is known as the *celestial equator* and cuts the ecliptic at the equinoxes. The position of the sun on Mar. 21 and Sept. 21 is on the Equator or equinoctial points. Then, there are two periods in the year when the sun

has reached its greatest distance from the Equator—June 21 and Dec. 21. These four points are distant from each other by a quadrant of a circle, or 90° . Each quadrant is divided into three arcs, or 30° , from which are reckoned 12 signs of 30° , called *signs of the zodiac*, being named from constellations through which the ecliptic passes. The equinoctial points are not fixed, but recede westward about 50 seconds in a year, while the angle at which the ecliptic stands to the Equator is diminishing also about 50 seconds in a century. The decrease, however, has a limit, and there is a point beyond which it can never pass. It requires 8,000 years to change a degree, and this can never sensibly affect the seasons.

Eclogues (*ē-k'logz*), a class of pastoral poems, so named from the *Eclogues* of Virgil. Originally poems of this class consisted of a conversation between two shepherds, but today any short pastoral poem may be considered an eclogue. Spenser's "Shepherd's Calendar" is a good example of an English eclogue.

École des Beaux Arts (*ā-kōl' dā bō xār*), the national school of fine arts in Paris, France, founded as an academic school by Mazarin in 1648. The present name was not given to it until 1815, and a system of workshops, known as *ateliers*, was added to the main institution in 1863. It ranks as one of the most important schools of fine arts in the world. Both men and women between the ages of 15 and 30 have free access to the courses, which include drawing, sculpture, painting, engraving, architecture, modeling, and gem cutting. Foreign students are not subject to the age regulation and not eligible to the *Prix de Rome*, awards established by the French government in 1666 entitling art students to studies at *l'Académie de France* in Rome. Students may remain as long or short a time as they desire, but the regular course is from 8 to 10 years. Many famous artists have studied there, and the faculty has contained many famous names.

Ecology (*ē-kōl'ō-jī*), a branch of biological science that deals with the relations of all living organisms, including man, to their environment or habitat. It treats of the responses of single organisms, or communities of organisms, to environmental stimuli, and the changes in environments wrought by the activities of organisms. The term *ecology* is derived from the Greek words *oikos* a house or home (habitat) and *lógos* a discourse, so that literally ecology may be defined as a treatise of the home relations of organisms. It is usually divided into two classes on the basis of the type of organisms studied: *Phytoecology* or plant ecology, and *Zoocology* or animal ecology. Certain aspects of human ecology are often treated separately as a part of sociology (see later in this account), the science

that deals with the natural, physical, and social laws or forces which regulate human society in all its phases, existing and historical as well as savage and civilized. General ecology is further divided into *autoecology* and *synecology* which are concerned, respectively, with habitat conditions in relation to a single animal or plant species, or to a community of species.

An environment is a complex of physical and biological conditions or factors which affect a plant or an animal, or a community of such organisms. The principal physical factors are radiant energy or light, temperature, and rainfall; gaseous content, humidity, temperature, and pressure of the atmosphere; wind velocity; type, texture, humus, and mineral content of the soil; and salinity, mineral and gaseous content, movements, and pressures of water. Most of these factors may be subject to seasonal and geographical variations but have a pronounced effect on the type, morphology, distribution, and responses of organisms. The biological factors are living organisms, which also have a marked influence on the environment of other organisms. An abundance of cereal grasses, for instance, creates a nutritional environment favorable to herbivorous animals, and these in turn affect the population and type of carnivores in that locality. In the same manner the action of earthworms will have a favorable effect on the fertility and texture of soil and thus influence plant growth. Similarly the presence of nitrogen-fixing bacteria in the soil will determine the growth and development of legumes. Ecology is thus concerned with the relations of all of these factors to living organisms.

Ecology as a distinct science began in 1749 with the writings of Georges de Buffon (*q.v.*) on the relations of animals to environment. The next most important contribution in this field was Malthus' (*q.v.*) classical treatise on population (1803). Many outstanding naturalists, biologists, and botanists, including Humboldt, St.-Hilaire, Haeckel, Möbius, Wallace, Hensen, Schroeter, Wheeler, Clements, and Warming, have contributed to the development of ecology as an exact science. St.-Hilaire used the word "ethology" for the study of relations of organisms to environment. Haeckel proposed the alternate term "oekologie," which was gradually accepted. Schroeter introduced subdivisions called *autoecology* and *synecology*.

In sociology, social ecology is defined as the science of the distribution of men as social units. This distribution follows certain patterns, which are conditioned through such diverse factors as geographical situation, climate, possibilities of traffic, etc. Social ecology studies not only the causes for the distribution, but also the patterns which develop (individual settlement, village, town, city, regional integration, state, nation). In

each single case, the relationship of men to their environment has to be examined. Furthermore, through the form of distribution we find certain very definite social relationships which influence the processes of cooperation, competition, selection, and accommodation, *i.e.*, the complete network of social interaction. Urban ecology meets, for instance, with the specific problems which develop from living in a city, such as distance between living place and working place, problems of suburban existence, etc.

Generally speaking, ecology represents a basic part of geography, sociology, social psychology, and even city planning.

Economic Cooperation Administration often used in abbreviated form, E.C.A., name of the U.S. agency set up in 1948 to carry out the European Recovery Program (*q.v.*), known as the Marshall Plan.

Economics (*ē-kō-nōm'iks*), the science of production, distribution, and consumption of goods and services. Economics is concerned with the activities of man in the process of earning a living and of applying his income to the satisfaction of his wants. Formerly this science was called political economy.

HISTORICAL DEVELOPMENT AND THEORIES: Originally man's ideas concerning economic activity found expression in moral codes. The economic thinking of the early Greek and Roman writers was conditioned by the religious, industrial, and social environment in which the thinker lived. Solon believed in the wide distribution of property, and Aristotle (*qq.v.*) discussed the functions of money as well as the significance of the division of labor. The Romans, organized for military and political purposes, added little to the science of economics.

The Middle Ages: Medieval scholars were interested in the application of ethical concepts to economic life. Such ideas as the "stewardship of wealth," or the obligation of the rich to share their goods with the poor; the ideas of price fixing; prohibitions of usury; regulation of relationships between lord and his vassal; and the regulation of apprenticeships were quite in keeping with the religious ideals of the times.

The decline of feudalism (*q.v.*) and the rise of the town to a position of economic importance led to the development of the guild (*q.v.*) system, which, in turn, was replaced by the domestic system of home manufacture. These developments gave an impetus to the commercial revolution and the rise of national states such as England, France, Portugal, and Spain.

Mercantilism: The shift in political power from the town to the national state led to the development of mercantilism (*q.v.*). This theory held that a country's wealth depended upon the amount of gold and silver it possessed. To

secure gold and silver, a nation's exports had to exceed its imports (goods went out and gold came in). To enjoy this favorable balance of trade, a nation had to possess colonies which would provide sources of raw materials and act as markets to buy finished products. To accomplish this, a nation needed to have a large navy to protect both its merchant marine and its distant colonies. The success of this theory depended upon certain governmental controls of industry and commerce.

The rise of a wealthy merchant and industrial class, however, created an opposition to rigid governmental regulation over economic life. This opposition developed the economic theory of *laissez-faire* (*q.v.*) and gave rise to the classical school of economics.

The Classical School: The architects of this school were Adam Smith (*q.v.*), who in 1776 published "An Inquiry into the Nature and Causes of the Wealth of Nations"; David Ricardo (*q.v.*), who wrote "An Essay on Rent" in 1810; and Robert Malthus (*q.v.*), who published "An Essay on The Principle of Population" (1798).

The classical school made an important contribution to modern economic theory. The basic concepts advanced by these scholars were that (1) economic laws such as the laws of supply and demand and the rise and fall of the business cycle are inexorable laws which man cannot change; (2) the state should confine its activities to the mere protection of property and to the furnishing of certain services; (3) free competition should govern all questions of hours, conditions of labor, and wages and prices; and that (4) this *laissez-faire* policy would result in maximum benefits to all because an individual's self-interest would be a safeguard for individual conduct.

The Socialistic School: Social change and economic progress led to the development of new theories to explain the growth and operation of economic society. The Socialist school, influenced by "Das Kapital" by Karl Marx (*q.v.*), propounded the iron law of wages (*q.v.*) and the doctrine of exploitation of labor by capital (*q.v.*). The solution offered was the reorganization of society so that the state would own and operate the basic means of production.

Marginal Utility Economics: William S. Jevons (*q.v.*), in his "Theory of Political Economy" (1871), introduced the concept of marginal utility, which holds that the desirability and utility of a commodity are the important factors in the determination of its value. Prices are explained on the basis of "use" value, which is determined by the scarcity of the commodity. Prices, moreover, must equal the cost of production of the marginal (least efficient) producer in order that the marginal producer may stay in business.

The Institutional School: Economists like Thorstein B. Veblen (*q.v.*), and, recently, Sumner Slichter, have suggested that the abstract assumptions of the classical school may be of some value, but that a more practical procedure would be to study the operation of current economic institutions such as banks, the stock market, foreign trade, and labor organization.

GENERAL PROBLEMS: Economic society is dynamic and ever-changing. Consequently, the application of principles and concepts changes. Basic factors which must be considered, however, are (1) resources—vegetable, animal, and mineral; (2) the size of the population as well as the spirit of the people (whether they are industrious and enterprising or not); (3) the climate—for most of the industrial centers of the world are located in the temperate zones; (4) technological development and the use of power to run machines; and (5) the form of government (whether it is democratic, permitting the private ownership of property and individual freedom of enterprise; or whether it is Communistic or bureaucratic, controlling the economy for the benefit of the state).

The Modern Economic Society: Modern methods of production, distribution, and consumption have been complicated by the growth of power-driven machinery and the practical application of scientific discoveries to daily life. People tend to concentrate in industrial, and urban, areas and thus create new problems of production, transportation, and communication.

Foodstuffs and raw materials are gathered from widespread points and concentrated in industrial areas, from which they are again sent out as manufactured goods. Improved farm machines such as power-driven tractors have made it possible for fewer farmers to produce increasing quantities of foodstuffs.

The increased use of gasoline, oil, and electric engines as well as water power has resulted in more rapid transportation by land, water, and air. (Nuclear-power applications are expected to intensify this process.) Motor traffic has stimulated road building, decreased the farmer's isolation, and extended the range of both domestic and world markets. Radio and television have brought the four corners of the earth into almost instant communication.

These economic developments have depended upon the application of the three principles of (1) the division and specialization of labor, whereby each operation in the economic process is reduced to the simplest and most efficient operation possible; (2) automation (*q.v.*), in which machinery is used to replace human labor wherever possible; and (3) mass production, which gathers huge quantities of raw materials, capital funds, and masses of workers and integrates

ECUADOR

tudinal valleys and plateaus. Two chief mountain ranges, both containing snow-clad summits, traverse the country from north to south, though the western of these has the more highly elevated peaks. It contains the highest summit in Ecuador, Chimborazo (20,500 ft.), but its peaks are generally lower than those of the eastern range. The loftiest mountains of the latter are Antisana, Cayambé, and Cotopaxi, the last-mentioned being 19,612 ft. The seacoast is quite uniform, indented only by the Gulf of Guayaquil. Many of the plateaus take the form of valleys among the mountains and their soil is generally fertile. In the eastern part of the country, east of the Andes, is a vast fertile plain belonging to the Amazon basin.

A larger part of the country slopes toward the east, and the drainage is chiefly by tributaries of the Marañon, as the upper course of the Amazon is called. These tributaries include the Napo, the Putumayo, and the Japura, and some of these streams furnish transportation facilities with the Amazon. The rivers of the western slope are short and flow rapidly. They include principally the Mira and the Esmeraldas. Ecuador has numerous lakes, but all of them are small.

The climate is tropical, but is greatly modified by differences in altitude. Excessive heat and moisture render the eastern and western plains unhealthful, but some parts of the elevated interior are delightful, especially the valleys of the Andes that have an altitude of about 8,000 ft. The regions that have an elevation of more than 9,000 ft. have a cold and rigorous climate, but habitations are met with at much greater heights in many of the mountains. It may be said that the dry and the rainy seasons form two divisions of the year, the former from June to November and the latter from December till May. In the deep river valleys the thermometer seldom registers below 80°, while the elevated summits are covered with snow perpetually. The rainfall is abundant in all parts of the country, hence fine grasses and thick forests are abundant. Tropical vegetation thrives in regions elevated less than 6,000 ft., and above that it becomes more rigid. Among the wild animals are the tapir, alpaca, jaguar, monkey, vicuña, and many birds of prey and plumage.

AGRICULTURE. Farming is the chief industry and cacao is the principal product. It is cultivated extensively in the coastal region. Coffee takes second rank and is grown chiefly in the lowlands. Sugar cane is cultivated extensively. Indian corn, rice, tobacco, wheat, barley and oats are grown profitably. The forests yield cinchona bark, sarsaparilla, tagua nuts, vegetable ivory, and rubber.

Courtesy Pan American Union, Wash., D. C.

WEAVING PANAMA HATS (right)

Production of Panama hats is one of Ecuador's leading industries



Photo by Grace Line

DOCK SCENE IN GUAYAQUIL, ECUADOR'S CHIEF SEAPORT



Courtesy W. N. Taylor

CANELOS INDIANS IN THEIR PICTURESQUE DRESS



Courtesy Pan American Union, Wash., D. C.

SAN PABLO LAKE, ECUADOR



Alfalfa is cultivated for hay. All the domestic animals common to North America thrive, but sheep and cattle receive the larger share of attention.

MINING. Many minerals are found in the mountains, including coal, iron, zinc, and the precious metals, but little has been done to develop the mineral resources. Gold is the chief mineral product, and copper and petroleum are also obtained. Oil is now one of the chief items of export.

MANUFACTURES AND COMMERCE. Manufacturing interests are being developed, the most important products including cotton goods, flour, lumber, leather, clothing, shoes, and sugar. Coarse fabrics and straw braid used in making hats and other straw articles are produced in considerable quantities. Panama hats, made by hand from *toquilla* palm straw, are a principal product. Fruits and fish are canned to some extent for exportation. The exports usually exceed the imports. Foreign trade has been chiefly with France, Germany, Great Britain, and the U.S. in the order named.

Some of the interior trade is carried by pack animals, because many highways are not improved and become almost impassable in the rainy season. A good highway is maintained from Quito to Guayaquil, the chief port. Not more than 265 m. of railways were in operation in 1900, the principal line extending from Guayaquil inland, but today nine Ecuadorean railways operate over a length of about 650 m. Most of the telegraph and railway lines were built by foreign capital. Regular air mail and passenger services are maintained between Guayaquil and Quito.

POPULATION. The population is composed of mestizos, Indians, whites, and others; more than half of them live in rural areas. Spanish is the official language, although seven per cent of the people speak only Quechua, the ancient Inca language. The predominant religion is Roman Catholicism, but freedom of worship is guaranteed. Although elementary education is free and compulsory, schools are lacking; and the illiteracy rate is high. There are six universities. Guayaquil is the largest city and chief seaport. Other cities are Quito, the capital, Cuenca, Ambata, and Ríobamba. Population, 1960 (est.), 4,317,000.

GOVERNMENT. Ecuador is divided into 16 provinces. The constitution vests the executive authority in the president and a ministry, and the president is elected for a term of four years. The congress consists of two houses, the Senate and the House of Deputies, the members of which are elected by direct vote, in the former for four years and the latter for three years. All citizens who have reached the age of 21 years and are able to read and write are granted the right of suffrage. The Indians were practically in a condition of slavery and were not represented until 1896, when they were admitted to citizenship under certain restrictions. A supreme court of six judges con-

stitutes the highest judiciary. Eight divisional courts are located in various cities.

HISTORY. The early inhabitants of Ecuador were advanced in many of the arts of civilization, and they had many writings and records that were destroyed when their dominion was overthrown. At the time Pizarro conquered Peru for the Spaniards, Ecuador formed part of the great empire of the Incas. From 1564 until 1718 it existed as an independent presidency under Spain, and in the latter year became a part of the state of New Granada. A revolution, in conjunction with adjoining countries, against Spain secured its independence in 1822, when the Spaniards were defeated in the Battle of Pichincha, and in 1830 it was organized as a separate republic. In 1885, the Galapagos Islands in the Pacific Ocean directly south of the Equator were taken over by Ecuador. The present constitution dates from 1929, and since then the country has enjoyed an era of reasonable progress. By Act of Congress, Aug. 6, 1941, President C.A. Arroyo del Rio was granted unlimited power in economic affairs. Arrangements were made with the U.S. (Sept. 1942) to permit U.S. troops to occupy bases on the Santa Elena peninsula, western Ecuador, and on the Galapagos Islands, about 600 m. to the west. On Jan. 29, 1942, Ecuador ended relations with Germany, Italy, and Japan. In May 1944, a revolutionary group under Velasco Ibarra ousted the government of President del Rio and established a provisional government. Later, Ibarra was elected by the National Constituent Assembly to complete a four-year term. His government had a stormy tenure and was overthrown in 1947. At the same time Ecuador's international relations were amicable and beneficial. A charter member of the U.N., Ecuador agreed with Venezuela and Colombia (April 1946) on an initial \$20,000,000 investment to construct a joint merchant marine. In 1948 Ecuador was a party to the newly formed charter of the Organization of American States, drawn up at Bogotá, Colombia. The same year saw the creation of the Great Colombian Economic Organization, designed to promote economic cooperation among Ecuador, Colombia, Venezuela, and Panama. In the previous year Colombia had ceded to Ecuador the 772-sq. m. San Miguel Triangle, which had been in dispute for 25 years.

Ecumenical Council (*ēk-ū-mēn'i-kəl koun'sīl*), from the Greek *oikoumene*, meaning "world," a council to which Roman Catholic bishops and others entitled to vote are convoked from the whole world, under the presidency of the pope or his legates. Such a council must be convoked by the pope; in early centuries, in times of stress, the emperors presumed the pope's permission and themselves summoned the bishops.

The validity and force of an ecumenical coun-

cil derive exclusively from the active participation and approbation of the pope. It is not necessary that any such council be attended by an actual majority of all the bishops of the world. On the other hand, even a majority of bishops cannot constitute an ecumenical council without the presidency and confirmation of the pope. The fifth ecumenical council, called the Second General Council of Constantinople, was convoked in opposition to the pope, and for that reason its legality was questioned. Similarly, the Council of Basle (1431-37) is questioned as a separate council because it was dissolved by Eugene IV, and it is generally counted together as one with the Council of Ferrara-Florence (1437-39).

Twenty ecumenical councils have been held. The first, the Council of Nicaea, convened in 325, and the last, called the First Vatican Council, was summoned by Pius IX on Dec. 8, 1869, and adjourned without formal closing on July 18, 1870.

The Eastern Orthodox Churches (see *Holy Eastern Orthodox Catholic and Apostolic Church*) recognize only the first seven of these councils. The remaining councils were held after the separation of the Eastern and Western Churches (see *Schism*). The Eastern Churches have never since that time attempted to convoke an ecumenical council.

In recent times Protestant groups have used the terms "ecumenism" and "ecumenical movement" to designate a movement through which unity among all Christian churches can be attained by overcoming the divisions that prevent the realization of the one, ecumenical (that is, universal) Church. The movement presumes errors and deficiencies among the divided groups which, through compromise, will arrive at unity. The traditional function of an ecumenical council, however, is not to bring about a compromise but to state clearly, and as binding for all, the universally accepted doctrine.

Vatican Council II, formally convoked by Pope John XXIII with a papal bull issued Dec. 25, 1960, was announced in that document as being called for the promotion in the Church of "the sanctification of its members, the diffusion of revealed truths, the consolidation of its agencies." The pope's first intention of convoking the council was revealed on Jan. 25, 1959. An apostolic letter, dated June 5, 1960, set up ten commissions and two secretaries to prepare an agenda; the council opened on Oct. 11, 1962.

Pope John XXIII constantly expressed the wish that Vatican Council II might contribute to Christian unity, but his official pronouncements made it clear that unity would not be the first work of the council. Rather, he indicated that the council's works would be internal to the Roman Catholic Church itself but that the desired unity might be a subsequent result.

With modern means of communication and transportation, the need for ecumenical councils to declare accepted teaching is not so great as in former times. The second council, however, makes it possible for the bishops of the world, representing differing peoples with differing needs, to join with the pope in legislating for the Church.

Eczema (*ĕk'zĕ-mă*), in medicine, a non-contagious, inflammatory disease of the skin. One of the most common of skin diseases, it is characterized by a number of vesicles, pustules, cutaneous lesions which cause a red and swollen skin. It can be either acute or chronic. The disease can be caused externally by scratching, pressure, friction, heat, poisons, etc., or internally by dietetic errors, drugs, etc.

Edda (*ĕd'dă*), the name of either one of two works of Icelandic literature. See *Saga*.

Eddy (*ĕd'i*), MARY BAKER GLOVER, author and founder of Christian Science, born in Bow, N.H., July 16, 1821; died in Chestnut Hill, Mass., Dec. 3, 1910. She studied in her native town and in nearby academies as well as with private tutors and showed deep interest in religious and literary subjects. Afterward she moved to Charleston, S.C., having married, in 1843, George W. Glover, who died of yellow fever the following year. In 1853 she married Daniel Patterson, a dentist of Tilton, N.H., whom she divorced on statutory grounds in 1873. Four years later she married Asa G. Eddy, who died in Boston in 1882.

Always a serious student of the Bible, she intensified her deep meditation after an apparently fatal injury from a fall on an icy street in Lynn, Mass., in 1866. Her long study of the Scriptures resulted in the formulation of Christian Science. In 1879 she established the Church of Christ,

MARY BAKER EDDY

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Scientist. In September 1892, the mother church, the First Church of Christ, Scientist, in Boston, Mass., was organized. All Christian Science churches throughout the world are branches of the Church in Boston.

"Science and Health, with Key to the Scriptures" is her most widely known publication, which she issued in 1875. This work, the standard textbook of Christian Science, gives an outline of the understanding that Christian Scientists have of the Bible. Besides this, she wrote many treatises and lectured extensively. Her works include "Christian Healing" (1886), "Unity of Good" (1887), "Retrospection and Introspection" (1891), "Pulpit and Press" (1895), "Christian Science vs. Pantheism" (1898), and "Messages to the Mother Church" (1900-02).

Eddy, NELSON, baritone, born in Providence, R.I., June 29, 1901. After studying voice in New York, Dresden, and Paris, he sang with a Gilbert and Sullivan troupe and the Philadelphia Opera Co., and was soloist with the New York Philharmonic and Oratorio Society. A popular concert and radio performer, he has also starred in many motion pictures, including "Naughty Marietta" (1935), "Rose Marie" (1936), and "New Moon" (1940).

Eddystone Lighthouse (*ēd' dī-stōn*), a celebrated lighthouse on a dangerous reef in the English Channel, off the Coast of Cornwall. Because tides cover the rocks daily, it has been necessary to guard against shipwrecks. The first lighthouse, completed in 1699, was washed away in 1703. The second, built of wood in 1706, was burned in 1755. The third was a massive structure of limestone, with a granite enclosure at the foundation, and of sufficient height to cast a light 13 m. Owing to erosions at the foundation rocks by the action of sea waves, it had to be rebuilt in 1882. This structure stands 133 ft. high and throws a beam visible nearly 18 m. away.

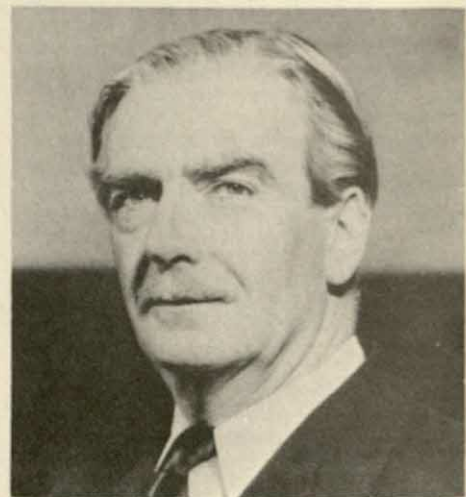
Edelweiss (*ä'dēl-vīs*), a flowering plant of the European Alps, botanically *Leontopodium alpinum*, of the composite family. It grows in tufts a few inches tall, with whitish, woolly leaves and flowers. The plants retain their appearance when dry. They are sometimes grown in rock gardens.

Eden (*ē'd'n*), GARDEN OF, in the Bible (Genesis 2:3), the first home of man. Here, Adam and Eve dwelt until they were banished for eating of the forbidden fruit. The garden was watered by a river which divided into four streams. Although two of these, the Tigris and Euphrates (*q.q.v.*), are named, the other two have never been identified surely. The site described in Genesis has been tentatively identified in many areas, most plausibly near ancient Babylon. See also *Paradise*.

Eden, (ROBERT) ANTHONY, FIRST EARL OF AVON,

statesman, born in Durham, England, June 12, 1897. He studied at Eton and was graduated (1922) from Oxford Univ., where he specialized in oriental languages. He was elected a member of Parliament as a Conservative in 1923 and began his diplomatic career in 1926 as parliamentary private secretary to Sir Austen Chamberlain (*q.v.*).

A cabinet member (1931-38), he was successively undersecretary of the foreign office (1931-33), lord privy seal and privy councillor (1934-35), minister for League of Nations affairs (1935), and secretary of state for foreign affairs (1935-38), resigning from office in 1938 in protest against Prime Minister Neville Chamberlain's foreign policy. After a year as secretary of state for the Dominions (1939-40), he returned to head the foreign office (1940), greatly contributing to British, American, and Russian cooperation. With the fall of the Churchill government in July 1945, Eden retired from the government. In 1951 a Conservative election victory returned him to the foreign ministry. Long regarded as Sir Winston Churchill's successor, Eden became prime minister in April 1955. A general election, held a month later, gave his party a large majority, but Eden retired in January 1957 (after the invasion of Egypt in 1956), because of illness. He was named first earl of Avon in 1961.



ANTHONY EDEN, FIRST EARL OF AVON

Eden Hall, the seat of the Musgrave family, in Penrith, Cumberland, England, demolished in 1935. The mansion was famed for a legend concerning the *Luck of Eden Hall*, an enameled glass goblet belonging to the family. Now on exhibition in London, the goblet may be of 10th-century Venetian workmanship. The legend was that one of the Musgraves seized the goblet from

the fairies at St. Cuthbert's Well and was thereupon warned that the future luck of his family would depend on keeping the goblet unbroken. It was treated in a ballad by Johann Uhland, translated by Longfellow (*q.v.*).

Edentata (*ē-dēn-tā'tā*), an order of mammals established over a century ago by Cuvier and characterized by degenerate teeth or no teeth at all. Because these animals appear to have little evolutionary kinship, the edentates are now divided into three separate orders. The order *Xenarthra* is characterized by extra joints between some of the vertebrae and includes species of anteater, sloth, and armadillo (*q.v.*). The order *Pholidota* comprises the pangolins or scaly anteaters of Africa and southern Asia, and the *Tubulidentata* comprises the armadillo (*q.v.*); they attain a length of 5 ft.

Ederle, GERTRUDE CAROLINE, swimmer, born in New York City, Oct. 23, 1906. She learned to swim at an early age, and by 1924 she held 18 world's records for long-distance swimming. In 1925 she broke the men's record by swimming the distance from the Battery to Sandy Hook in New York Bay in 7 hrs., 11 min. On Aug. 6, 1926, she became the first woman to swim the English Channel, covering the distance in 14 hrs., 31 min. and breaking the records of the five previous men channel swimmers. She has since devoted herself to teaching swimming.

Edessa (*ē-dēs'q*) or *VODENA*, a city in Greece, the capital of Pella department, ca. 48 m. N.W. of Salonika. The city manufactures cotton textiles and carpets and is the trade center for the agricultural region which surrounds it. The ancient Aegae, it was the earliest capital of the Macedonian kings. Population, 1951, 15,415.

Edessa, an ancient city of Mesopotamia. See *Urja*.

Edgar (*ēd'gēr*), called "the Peaceful," king of England, son of Edmund I, born in 944; died July 8, 975. In 957, the Mercian nobles, dissatisfied with the rule of his elder brother, Eadwig (Eadwig), made him king of England north of the Thames (Mercia and Northumbria), and upon the death of Eadwig he became king of a united England. An energetic civil and military administrator, Edgar recalled St. Dunstan (*q.v.*) from exile and installed him as Archbishop of Canterbury in 961. Together, they instituted vast monastery reforms.

Edgar Atheling (*āth'el-ing*), English prince, grandson of Edmund II (called Ironside), born, probably in Hungary, ca. 1057; died ca. 1130. After Harold's death at the Battle of Hastings in 1066, he was chosen to succeed to the English throne, but was forced to submit to William the Conqueror. After leading two unsuccessful uprisings against William (1068, 1069), he made peace in 1074. Later (1097), he succeeded in plac-

ing his nephew Edgar on the throne of Scotland. In 1099 he went on the First Crusade.

Edge (*ēd*), WALTER EVANS, politician, born in Philadelphia, Pa., Nov. 20, 1873; died in New York City, Oct. 29, 1956. An influential newspaper and advertising executive, Edge was an active Republican politician for half a century. He was governor of New Jersey (1917-19; 1944-47), U.S. Senator (1919-29), and ambassador to France (1929-33). On the state level, Edge advocated reform legislation; in the Senate, he was an articulate opponent of isolationism.

Edgehill (*ēd'hil*), a ridge on the border of Oxfordshire and Warwickshire, England, where the first important battle of the English Civil War was waged. There, on Oct. 23, 1642, the Royalists under Charles I fought with the Roundheads led by Robert Devereaux (3rd Earl of Essex) in a bloody but indecisive struggle.

Edgeworth (*ēd'wūth*), MARIA, novelist, born in Black Bourton, Oxfordshire, England, Jan. 1, 1767; died in Edgeworthstown, County Longford, Ireland, May 22, 1849. The daughter of Richard Lovell Edgeworth (1744-1817), an author and inventor, and the aunt of poet Thomas Lovell Beddoes (1803-49), she is known for her stories of Irish life. "Castle Rackrent" (1800), "Belinda" (1801), "The Absentee" (1812), and "Ormond" (1817) are typical of her lively, humorous tales. Her friend, Sir Walter Scott (*q.v.*), acknowledged a debt to her portraits of Irish life. She also wrote children's stories, such as "Moral Tales for Young People" (1801) and "Early Lessons" (1801).

Edict of Nantes (*ē'dikt ōv nānt*). See *Nantes*, *Edict of*.

Edinburgh (*ēd'n-bū-ō*), the capital of Scotland, in the county of Midlothian, on the Firth of Forth, ca. 45 m. E. of Glasgow. It is the cultural, academic, and administrative center of the country, with a rich artistic heritage. It grew up around Edinburgh Castle, an elevated fortress on Castle Rock, which later housed the royal apartments. The Norman Chapel on Castle Rock was built in 1076 by Queen Margaret. The Palace of Holyrood is the official residence of the queen of England when she is in Edinburgh. Originally a guest house for a 12th-century abbey, it became a royal palace under James IV, ca. 1500, and has many associations with Mary Queen of Scots. The church of St. Giles dates from the 12th century, and St. Mary's Cathedral from the 10th century. Parliament House, finished in 1640, was the home of the Scottish parliament until 1707. It now houses the supreme courts. Other buildings of historic interest are the National Gallery, Royal Scottish Acad., National Museum of Antiquities, and the birthplace of Robert Louis Stevenson. Princes Street, a famous promenade dividing the city into its old and new



Courtesy Ewing Galloway, N. Y.

VIEW OF EDINBURGH

sections, runs parallel to Princes Street Gardens. Edinburgh is rich in academic and literary history. The Univ. of Edinburgh was founded in 1583 under James VI (James I of England). The Old College, on the site of "Kirk o' Field," the scene of the murder of Lord Darnley, was designed by Robert Adam but not completed until 1838. Newer buildings include the Medical School, McEwan Hall, and "The King's Buildings" for the science departments. The university has faculties of divinity, law, arts, science, and music, in addition to its famous Coll. of Medicine. The city was a lively literary center in the 18th and 19th centuries when David Hume, Adam Smith, and Sir Walter Scott flourished here, and the *Edinburgh Review* (*q.v.*) was published. It is still a center of artistic activity with its annual Edinburgh Festival of music and drama.

Tourism and printing and publishing are the principal industries of the city; tanning, whisky distilling, and the manufacture of machinery, machine tools, and paper are also important.

The historic beginnings of Edinburgh date from Edwin of Northumbria, who established a military post here *ca.* 617. It was chartered as a burgh in 1329 under Robert the Bruce, and in 1437 it superseded Perth as the capital of Scotland. The town walls for its defense were begun in 1450, and in 1544 it was sacked by England. Its importance decreased after 1603 when James VI of Scotland left to become James I of Eng-

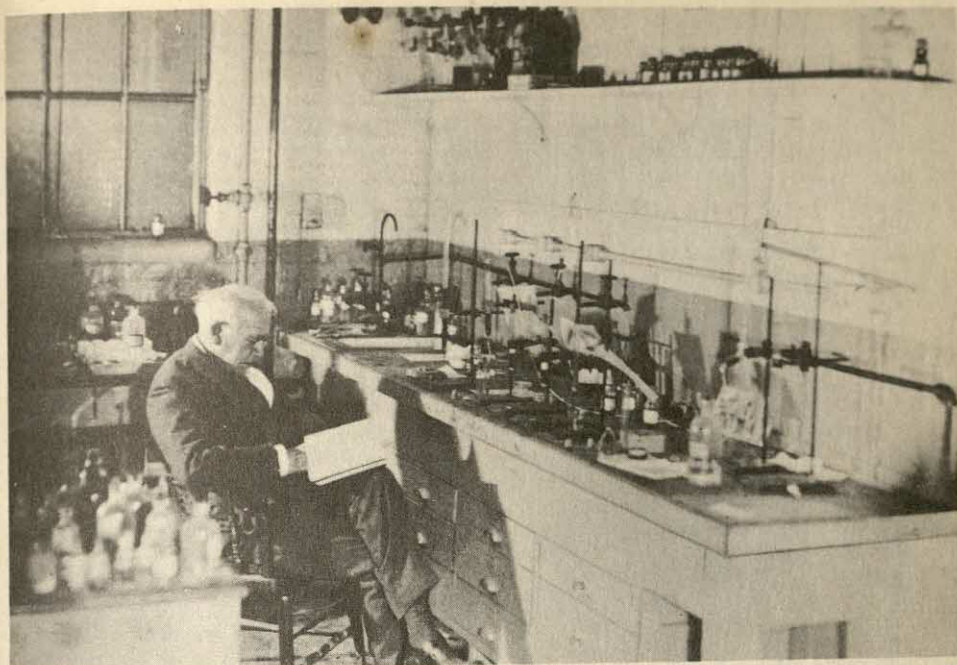
land. The Act of Union (1707), uniting England and Scotland, completed its political decline. Population, 1951, 466,770.

Edinburgh, DUKE OF. See *Philip, Duke of Edinburgh, Prince.*

Edinburgh Review, a periodical published by Archibald Constable (*q.v.*) in Edinburgh, Scotland, and founded (1802) by Sydney Smith, editor, and Lords Brougham and Jeffrey. It was the first of many literary journals that sprang up in the 19th century. Although it exercised a wide influence in favor of the Whig party during its lifetime (1802-29), its permanent importance was as a literary review. Its contributors included Thomas Macaulay, William Hazlitt, and Thomas Carlyle.

Edison (*ed'i-s'n*), New Jersey, a township in Middlesex County, New Jersey, surrounding Metuchen (*q.v.*); known as Raritan Township prior to 1955. It is served by the Pennsylvania R.R. Population, 1957, 34,000.

Edison Institute, a museum village in Dearborn, Mich., established (1933) by Henry Ford, and comprising a historical museum and a replica of an early American town. The replica, called Greenfield Village, has a church, town hall, inn, school, etc., located on its *ca.* 250 acres. It is best known for the historic structures that have either been moved from their original sites or reconstructed. These include Thomas Edison's Menlo Park workshop and laboratory; the Logan County, Ill., courthouse, where Abra-



Courtesy Edison Electric Institute, N. Y.

THOMAS ALVA EDISON

ham Lincoln practiced law; and the homes of Stephen Foster, Luther Burbank, Noah Webster, and Henry Ford. The adjoining historical museum has replicas of Independence Hall, Congress Hall, and Old City Hall in Philadelphia.

Edison, THOMAS ALVA, inventor, born in Milan, Ohio, Feb. 11, 1847; died in Menlo Park, N.J., Oct. 18, 1931. His formal education was limited to three months in a Port Huron, Mich., school in 1854. He was a newsboy on the Grand Trunk R.R. at the age of 12 and later worked as a telegraph operator in various cities. His first patent (1868) was for an electrical vote-recording machine. After setting up a laboratory in Newark, N.J., he worked on stock tickers, automatic telegraph systems, and the electric pen which later developed into the mimeograph machine. In 1876 he moved to Menlo Park, N.J., where he was known as "the Wizard of Menlo Park." An important advance in telephonic communication was made in 1877 when he invented the carbon transmitter for the Western Union Telegraph Co. That same year he took out a patent for a phonograph (*q.v.*), and he later invented the Ediphone for office dictation. His most famous invention was the incandescent lamp (Oct. 21, 1879). He spent the next years devising a system for producing and distributing electric light and power; the system included generators, motors, sockets, junction boxes, and fuses, as well as an experimental electric railroad (1880). The result of this activity was the

Pearl Street plant (1881-82) in New York City, the first central electric-light power plant in the world. In 1883 he discovered the "Edison effect," in which electricity passes from a filament to a metal plate inside an incandescent lamp (foreshadowing the radio tube); and in 1885 he invented a telegraphic system for communicating with moving ships and trains. In 1887 he moved to West Orange, N.J., and in 1891 he applied for a patent on a kinetoscope machine which led to the development of motion pictures. His subsequent work included a magnetic method of concentrating iron ores and an alkaline storage (Edison) battery.

During World War I, Edison worked on naval and chemical problems and was named (1915) head of the U.S. Navy Consulting Board. After the war, he worked on the production of synthetic rubber from plants, particularly goldenrod. In 1927 he was admitted to the National Acad. of Sciences. Although Edison was not a pure scientist, his contributions to the field are legion. His talent was in the practical application of scientific principles (he held over 1,300 U.S. and foreign patents). A memorial tower was erected (1938) in Menlo Park, and his laboratory and other buildings are at the Edison Institute (*q.v.*).

Edman, (*éd'man*), IRWIN, philosopher, educator, and author, born in New York City, Nov. 28, 1896; died there, Sept. 4, 1954. A Columbia graduate (B.A., 1917; Ph.D., 1920), he taught

there from 1918 and was a professor from 1935. He wrote many books, including "Human Traits and Their Social Significance" (1920), "Four Ways of Philosophy" (1937), "Philosopher's Holiday" (1938), "Arts and the Man" (1939), "Philosopher's Quest" (1947), and "Under Whatever Sky" (1951).

Edmonton (*ēd'mūn-tūn*), capital of the Canadian province of Alberta, on the North Saskatchewan River. Located ca. 500 m. E. of Vancouver, B.C., it is served by the Canadian National, Canadian Pacific, and Northern Alberta R.R.'s. Situated in an agricultural region, it is an industrial city near large oil fields, mineral deposits, and supplies of natural gas. Its industries include oil refineries, packing plants, and the production of chemicals, cement, and plywood. The surrounding farm land produces stock, poultry, and grains. The city is the seat of the Univ. of Alberta (1906). The Legislative Building (1912) is on the site of Edmonton House, part of Ft. Edmonton, a trading post established by the Hudson's Bay Co. in 1821. The village was founded in 1871; incorporated in 1892, it became a city in 1904. Edmonton has been the capital of Alberta since 1906. In 1912 it absorbed the city of Strathcona on the south bank of the North Saskatchewan River. Population, 1958, 252,131.

Edmund (*ēd'mūnd*), the name of two early kings of England. Edmund I succeeded his brother, Athelstan, in 940. In his vigorous reign Cumbria was conquered and bestowed on Malcolm, King of Scotland. While at a banquet, on May 26, 946, he was slain. Edmund II, called Ironside, eldest son of Ethelred II, was born in 989. A division caused the two political parties to elect both him and Canute as king, the former in 1016. Though victorious over Canute in several battles, he was defeated in Essex and compelled to cede large tracts of territory. His reign was terminated by his death in about seven months, and Canute became king of the whole of England.

Edmunds (*ēd'mūndz*), GEORGE FRANKLIN, statesman, born in Richmond, Vt., Feb. 1, 1828; died Feb. 27, 1919. His education was received in the public schools and by instruction under a private tutor. Later he studied and practiced law, and was a member of the Legislature of Vermont from 1854 to 1859, serving three years as speaker. In 1861-62 he was a member of the State Senate, serving as presiding officer pro tem. Soon after he was appointed to fill a vacancy in the U.S. Senate, in which he was distinguished as an opponent to President Johnson in his reconstruction policy and favored his removal from office. He was elected by the Legislature in 1866 to fill the unexpired term of Solomon Foot and remained in the Senate consecutively until 1891, when he resigned on account of impaired health. Edmunds served as a member of the electoral commission

of 1877, casting his vote for R.B. Hayes. After Arthur was elevated to the Presidency, he became president pro tem. of the Senate. Among the best known of the many important laws written by him is the act for the suppression of polygamy in Utah, which is known by his name. As a parliamentarian and skilled legislator he took high rank.

Edom (*ē'dūm*), meaning *red*, the name given to Esau on account of the red pottage secured by him from his brother Jacob. The name was also given to the country settled by Esau, having been previously known as Mt. Seir. It was about 100 m. long and 20 m. wide and lay between the Dead Sea and the Gulf of Akabah, an inlet from the Red Sea. Bozrah, now Buseirah, situated in the extreme northern part, was its chief city and the capital. During the reigns of David and Solomon, Edom was under subjection to the Israelites. Later the Edomites ravaged the southern borders of Palestine, and were denounced with considerable vehemence by some of the prophets of Israel. After the destruction of Jerusalem, in 70 A.D., the name of Edom or Idumaea disappeared from geography.

Education (*ēd-ū-kā'shūn*), a word derived from the Latin *educare*, meaning to lead forth. In a philosophical sense education is the natural inheritance of every individual, since he is impressed and developed for good or evil by all with which he comes in contact, everything he sees, feels, hears, and does influencing action and forming tendencies. According to this view, education begins in infancy and terminates only when life ceases, embracing all physical, intellectual, psychical, and moral growth or change, as influenced by one's environment and experiences. In the narrower and more common meaning, education refers to specific training of the mental and physical capacities, generally in an institution of learning. In connection with education in this sense, the science of instruction is referred to as pedagogy, and a given course of study as a *curriculum* (pl. *curricula*).

While there is still a gap in modern education between lofty theory and actual practice, civilized nations have come to realize the tremendous importance of educating their citizens. In the broader sense, education and its ramifications embrace the entire history of mankind, and bear directly upon the culture of a people. Living standards, politics, production, contributions—in fact, every phase of life—are influenced by education.

FUNDAMENTALS AND AIMS. In a rational system of education it is necessary to enrich the life of every member of society with the fundamental elements and basic principles that underlie true development. This should be done for the universal good, and to the fullest extent of the personal

capacity of each individual. In addition to general culture, a purposeful education also implies a preparation for life, for the individual's role in society as a worker and a citizen, and for the worthy use of his leisure time. Educational aims may vary according to the civilization, but fundamentally they include development of the *whole* individual in relation to his environment. This is to be brought about by sound educational theory supplemented by practice.

EDUCATIONAL SYSTEMS. The systems of schools for the general dissemination of education have been and still are greatly diversified in courses of study, and the scope of education itself has shown marked differences in all ages and civilizations. A complete system of schools involves the establishment of many institutions with diversified courses of study, each aiming to cover its portion of a general system, and articulating in a well-connected way with others. Most school systems are divided into *elementary* and *secondary* schools, and *colleges* and *universities*.

Among the schools recognized by the leading nations are: 1. *Kindergartens*, schools in which children of pre-primary age are trained to develop right activity of the body and elementary growth in intellect. In communities not recognizing this class of schools essential in the process of education, the elementary work is done largely in the homes by mothers or private teachers. The average age for entrance into kindergarten is five. *Nursery* or *pre-primary* schools care for and teach children under this age, in many cases freeing mothers for work. 2. *Common* or *elementary* schools, also called *grammar* or *public* schools, offering the rudiments of education. 3. *Secondary* or *high* schools, to introduce subjects of higher learning, such as foreign languages, algebra, chemistry, etc., to prepare students for further schooling or for vocations. 4. *Vocational* schools, for instruction and work experience in various occupations. 5. *Colleges* and *universities*, for instruction in the various branches of specialized higher learning, and preparation of students for professional school, or for varied careers after college. Special schools for the training of teachers were formerly called *normal* schools, but are now known almost everywhere as *teachers' colleges* or *teacher-training institutions*. 6. *Graduate* schools, to prepare for definite professions, such as medicine, dentistry, law, etc., or to offer advanced courses and research in all branches of higher learning.

Naturally, within such divisions there are many subdivisions, such as *junior high schools*, *junior colleges*, etc., but for the most part the above classifications represent the main categories in which modern educational institutions fall.

HISTORY. The history of education is concerned, more or less, with every epoch from which any

record has passed down to us. Few studies are of deeper interest than the one that traces the systems under which man's influence upon nature was enlarged through the successive centuries, and by means of which he attained his present high development. Sacred history represents the first parents created in the image of God, and accords them efficiency to reason and converse with each other. Cain was not only a tiller of the soil, but is represented as a builder of a city which he named Enoch, after his firstborn son. In the seventh generation from Adam, and while that patriarch still lived, it is recorded that Tubal-Cain "was an instructor of every artificer in brass and iron," and that his half-brother, Jubal, "was the father of all such as handle the harp and the organ."

While it is impossible to determine the exact status of antediluvian education, it is evident that in the twilight ages man advanced materially in civilized arts. The invention of the organ and the harp, and the skill of artificers in brass and iron, imply that many others and related discoveries and inventions had been made. However, advancement in education dates from and is measured largely by the art of writing, this art being considered the prime meridian from which to measure. Committing thought to writing made it possible to pass funds of knowledge from generation to generation with much better results than by story and tradition. Besides, all succeeding generations were enabled to ponder the achievements of preceding ages, as well as profit by the failures and successes of the generation that preceded them. The writings were not necessarily made up of such characters as are used exclusively by the

PLATO AMIDST HIS DISCIPLES

From a Pompeian mosaic, 1st century B.C.



Caucasians at present, but included various forms of hieroglyphics and symbolical characters on monuments, stones, and architectural structures.

Oriental Nations. Among the early civilizations and antiquities the Chaldean, Babylonian, and Assyrian take high rank, and much knowledge of their skill and progress has come to us through various sources by means of monumental writings and architectural ruins, most of which are given us by the Greek historian, Herodotus.

The rise of the Chaldean civilization dates from Nimrod, about 2300 B.C., when Babylonia was founded. These ancient peoples erected great cities, collected vast libraries, founded schools, and disseminated knowledge and learning for many centuries. Passing from their settlement on the Tigris and Euphrates to Egypt, we find a high state of civilization and a wide range of culture that had their beginning more than 4,000 years ago. In their city of Alexandria was a great university, which taught a system of geometry perfected by Euclid, and in accord with which the Egyptian intellect towered and expanded, attaining a foothold almost as durable as their gigantic pyramids and the time-enduring sphinx. Their system of education, like that of India, was largely characterized by the baneful influence of castes, resulting in classes who towered as educational giants on the one hand, and descended to the status of intellectual pigmies on the other.

In scrutinizing human history it is remarkable that practically every portion of value in education comes generally from the Caucasian race, the Mongolian being the only other race that presents any original theories and primitive acquirements of material knowledge. The educational system of China dates from Confucius, who lived about 500 B.C., and ever since his teachings have had a marked influence upon the Chinese and some effect among the Japanese, though Brahmanism and Buddhism have had more or less influence upon the education of both peoples. China, probably the country that for the longest time adhered to ancient theories of education, recently set out on a national scheme of modern pedagogy, making great strides in erasing illiteracy. Japan, in the course of her westernization process, adopted many good points of European and American educational systems.

Ancient Classical Nations. From Western Asia and Northern Africa education moved westward to Greece, and eventually from Greece to Rome. But it was the Greeks who first regarded education as a scientific body separated from religious beliefs and ceremonies. According to the writings of Homer, it is certain that the early education of Greece was, however, patriarchal. Later four divisions arose, of which the Dorians and Ionians are the most noteworthy. The seat of influence of the former was at Sparta, and their higher

education was largely the outgrowth of the codified laws of Lycurgus, though the teaching of Pythagoras influenced the whole of Greece by its strictness and aristocratic tendencies. Solon codified the laws of the Ionians. Their center of influence was at Athens. Socrates, Plato, and Aristotle are the great teachers of Greece, and rank highest in power and influence.

Roman education was founded on Greek culture, introduced in its entirety about 250 B.C. The great orator, Cicero, gave perfection to Roman rhetoric, while Seneca and the orator Quintilian rank as great educational writers. Greek education aimed to develop especially the beautiful and good, or as Plato expressed the chief educational aims, "gymnastic for the body, music for the soul." Both Plato and Xenophon felt that education of the people is the state's rightful duty. The Greeks as well as the Romans maintained a highly educated priesthood, though education was extended to all save the slaves and extremely poor. The young were trained early in life. Physical and intellectual strength were objective in all, while their religious culture consisted of the worship of representative gods, such as we read of in mythology. These were sacredly represented in statuary, temples were built to their honor, and the young were admonished to do them reverence.

Early Christian Era. The influence exercised

TWO WRITERS AT A MONASTERY

From a manuscript, 11th century



by the teachings of Christ is the most marked and contains the essential and basic principles of education. They oppose all external distinction among men, recognize the equality of women, and make capability the only limit of man's development. Man's learning was preserved through the medieval period by the work of the monks, and the monasteries were centers of learning.

Education in Europe. Renaissance Europe of the 15th and 16th centuries saw great intellectual stimulation and widening of interests beyond the church. Rude beginnings of science and other secular subjects were pushing their way into the accepted religious character of education at the time. Such influences as Petrarch and Vittorino da Feltre and the early universities served to broaden the concept of education. The Reformation (*q.v.*) was the beginning of the great epoch of modern education in Europe. Promoted by Luther, Melancthon, and Wycliffe, it taught the doctrine of justification by faith alone and the Holy Scriptures. This caused the Scriptures to be translated into the modern tongues and gave rise to schools which taught the people to read and write. Ultimately it made possible the great universities, such as those at Oxford, Cambridge, Edinburgh, Berlin, Paris, and Vienna. Among the teachers and writers who influenced educational thought in Europe are Johannes Sturm, whose early *Gymnasium* in the 16th century influenced German education, Erasmus, Bacon, Comenius, Locke, Francke, Rousseau, Kant, Fichte, Richter, Hegel, Rosenkranz, Herbart, Bencke, Pestalozzi, Froebel, Spencer, and the monastic orders.

The elementary education of modern Europe is largely free and compulsory, and the courses of study cover, not only branches of classic learning, but technical subjects as well. Institutions and associations of teachers are maintained and exercise influences similar to those in America, while periodicals and books devoted to pedagogy are read extensively. Statistics place Sweden in the highest rank among the nations of the world on account of its common-school education, illiteracy there being limited to the lowest per cent. The progressive nations of Europe, and, for that matter, of the world, are giving closer attention to the building of schools and the education of their people for good citizenship and a fuller life than in any other period of history.

Education in America. Education has received great attention in America, though the U.S. and Canada represent its greatest development and most marked influence. The representative form of government makes it necessary to educate universally, else our democratic institutions must fail. Universal suffrage fulfills its purpose only by universal education. In recognition of this fact legislation along educational lines was early di-

rected to the building of schools and the founding of colleges. Massachusetts led the way in 1632 by requiring all children to be taught to read and write. Later, when the U.S. was established as an independent government, Congress set aside lands to aid schools. Normal training schools for teachers are maintained in nearly all the states by public taxation, at which admission is free, and through whose influence a strong profession of teaching is developing. The Commissioner of Education is an important officer of the Federal government, whose influence for good by means of treatises, lectures, and published reports is widening constantly in the entire nation. See *Schools*.

The states maintain either state commissioners or superintendents of public instruction, while county superintendents and, in some states, commissioners, have local supervision. Teachers meet to exchange ideas at conventions and are certified to teach either by local officials, county superintendents, or state boards of examiners. In most of the states school attendance is compulsory and in all it is free of tuition. Some states maintain free schools devoted to the industries and higher learning, though many of such institutions are aided by the Federal government. Free state and city universities mark an advancement in higher education. Public schools are open and alike free to both sexes, but in a number of Southern states

EDUCATIONAL BACKGROUND OF U. S. ADULTS

Each symbol represents three million people

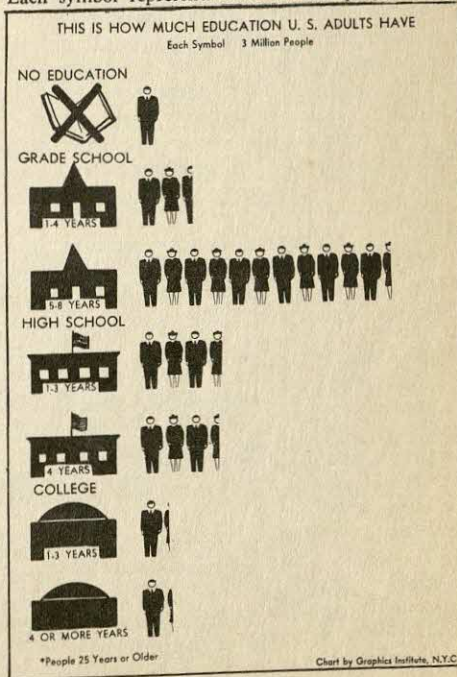




Photo by Newman-Schmidt Studios, Pittsburgh, Pa.

CATHEDRAL OF LEARNING, PITTSBURGH, PA.

The \$10,000,000 home of Pittsburgh University, covering about two acres of the fourteen-acre campus, is 680 ft. high and has 52 stories

separate schools are maintained for the education of Negro children. Besides the public schools and higher institutions, there are many denominational and private schools, colleges, and universities. Collectively they represent an immense capital and wield a marked influence for good. In states which have compulsory laws, attendance at private schools, which have courses similar to the public institutions, is considered to be in compliance with law. Among prominent American educators who have exercised a large influence in shaping educational theories we may name Horace Mann, G. Stanley Hall, William Torrey Harris, David Starr Jordan, William R. Harper, Herman Eduard von Holst, Andrew Dickson White, Amos Bronson Alcott, Charles William Eliot, Francis Wayland, William M. Beardshear, Samuel Eliot, Elmer Ellsworth Brown, William James, John Dewey, Nicholas Murray Butler, Edward Lee Thorndike, Stringfellow Barr, Virginia C. Gildersleeve, Robert Maynard Hutchins, James Bryant Conant, and Mildred Helen McAfee (qq.v.).

Through the efforts of these educators, together with general advancement of the social sciences, modern education in America has become aware of its wide implications. Progress is notable in new testing methods, revision of the old curriculum to include a broader scope of

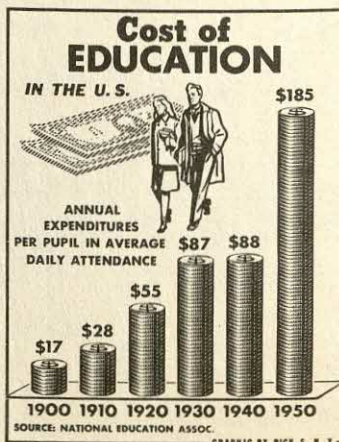
EDUCATION

knowledge, teaching methods, visual education, vocational education, substitution of interest and activity of the pupil instead of rigid discipline; the elementary schools as a whole have felt the advance of progressive education more than the institutions of higher learning. The introduction of laboratory methods of study and teaching (e.g., Dalton Plan), of the motion picture and the radio in the classroom have further strengthened the relationship between the school and society. One of the widely discussed of the new educational programs is the Springfield Program (q.v.), inaugurated in the schools of Springfield, Mass. A city-wide project to teach democratic living, it was designed to reach the adults as well as the school children. The purpose of the program is to teach the background of every nationality and religious group represented in the city and to demonstrate the meaning of good citizenship in the community.

The end of World War II found the schools in America ill-prepared for the return of thousands of veterans. Under Public Laws 346 and 16 the Federal government undertook to pay the tuition of all qualified veterans. By 1946 the percentage of veterans in the total enrollment of U.S. universities and colleges was 44.6 per cent. This total climbed to a peak in 1947 when slightly more than half (1,149,933) of all full-time and part-time college students were veterans. In 1948 and 1949 the number of student veterans declined, and the Korean emergency brought about a further decline in 1950 and '51.

The total enrollment in the nation's universities and colleges during 1950 was about 2,400,000. During the school year 1950-51, there were more than 30,000,000 students enrolled in all public schools in the U.S.

The general overcrowding of schools, particularly elementary and high schools, the lack of prestige of the teaching profession, and, above all, the low level of teachers' salaries (which



average less than the salary level of skilled labor) produced a situation in which the caliber of people attracted to teaching deteriorated. A strenuous but unsympathetic attempt at expansion of educational facilities is now taking place.

Dissatisfaction with college curricula has brought about a new emphasis on "common-core" subjects, consisting of a compulsory study of the basic traditions of western civilization. The Harvard and Yale Reports and the Princeton Plan are statements of this educational revolution.

For questions on integration in U.S. schools see *Negroes; Segregation*.

See also *College; Gary, Ind.; Kindergarten; Schools; Teachers College; Universities and Colleges*.

Educational Association, a society of teachers and educators to study methods and promote educational work. Many forms of societies of this kind are maintained. Local organizations are usually made up of the teachers and educators in a particular city or county, and these are tributary to the educational association of a state.

The National Education Association of the U.S., known as the N.E.A., was incorporated in the District of Columbia in 1896, when it succeeded the National Teachers' Association, which was organized at Philadelphia, Pa., in 1857. This association meets annually in different parts of the country, and at these meetings prominent educators read papers or lecture upon topics of interest to teachers in new methods or the supervision of school systems. A complete report of the proceedings, including the principal papers and lectures, is published for the benefit of the members. The organization also publishes a monthly *Journal*. This association has had a marked influence upon public instruction, especially by its celebrated report of the Committee of Ten in regard to secondary schools. It consists of 29 departments and the National Council, the latter being a board which exercises general advisory power. The membership is *ca.* 200,000.

Education, COMMISSIONER OF, the title of the chief Federal officer of education and of the same officer in some states (12). The title varies: it is superintendent of public instruction (28 states), superintendent of education (three states), superintendent of schools, and director of education in others. It is the duty of a commissioner of education to supervise the general management of schools and public institutions, and to publish recommendations and reports upon the methods of teaching and the management of educational system. In Canada various names are used in speaking of officials who have charge of educational work, such as minister of education, in Ontario; superintendent of education, in Nova Scotia; and commissioner of education, in Saskatchewan.

The Commissioner of Education of the U.S. is the chief officer of the national Office of Education at Washington, D.C., which was established in 1867. He is appointed by the President with the consent of the Senate. The duties are to collect educational statistics, diffuse information regarding the organization and management of schools and school systems, to promote the cause of education, and to present annually to Congress a report embodying the result of his investigations and labors. The office also has charge of vocational education.

Education, COMPULSORY, the term applied to the system of education in which attendance is required by the state for some fixed period. Nations have long recognized the importance of training youth for citizenship, hence some sort of school attendance has been compulsory, though in most cases the parent may select the particular school which the child is to attend; that is, the parent may choose to enroll the pupil in a public school or in a private institution where work of the same kind is done in certain branches. The law varies in fixing the compulsory period, usually beginning with the ages of five to seven years and extending to the ages of 14 to 16 years. In a majority of countries the compulsory period is eight years.

Since the state requires all of its citizens to pay taxes toward the support of the schools, it is held reasonable that the citizen should expect all children to receive the benefits of an education. Since the safety and future of society are dependent upon the intelligence of its citizens, it is quite essential to the state that no one should grow up without receiving proper training for the responsibilities of citizenship. Compulsory attendance laws were in force among the ancient, and training in military affairs was often required. Germany has had a compulsory attendance law for many years, and similar laws are on the statute books of almost all countries of Europe. In the U.S. and Canada they are enacted by the state or province, since these countries do not retain supervision over the public schools, but instead delegated this part of the government to the individual states and provinces. All the states have compulsory education laws, although they differ widely in enforcement and period covered. Truant officers are provided for by the laws, and such officers are usually appointed by the local boards of education. It is their duty to see that the attendance law is enforced, and parents are subject to a fine where the child is not in attendance in compliance with the law, though they cannot be punished without due trial. The employment of very young children in mines and factories in the past made it quite necessary that these laws be enforced.

Edward (*ēd'wērā*), known as the *Elder*,

King of England, ascended the throne in 901; died in 925. He was the son of Alfred the Great, whom he succeeded, but his right to succession was disputed by Ethelwald, who was killed in battle in 905. His reign was disturbed by wars against the Danes, but he subdued them and the native opponents as far as the Humber, and was recognized as overlord in the island.

Edward, called the *Black Prince*, son of Edward III, born in 1330; died in 1376. He was so named from the color of his armor. See *Edward III*.

Edward, called the *Confessor*, last of the old royal line of Anglo-Saxon kings, born in Oxfordshire, England, about 1004; died Jan. 5, 1066. He obtained possession of the throne in 1042, when he succeeded his half-brother Hardicanute as king. A number of attempts to establish his authority in England were ineffectual, and he lived in Normandy during the period preceding his succession. His reign was marked by the influence of foreigners, who exercised much power over him, and is characterized by many struggles between the court party, or Normans, and the old Anglo-Saxon party, the latter being under the leadership of Earl Godwin and his son Harold. Several wars with the Welsh terminated to his advantage, and foreign invasions were repelled successfully. History places him among the spiritless rulers of England. However, Pope Alexander III canonized him in 1161. He was succeeded by Harold, son of Earl Godwin, though it is held usually that the old English monarchy perished with him, largely for the reason that his immediate successor ruled only a few months.

Edward, surnamed the *Martyr*, King of England, born in 963; died in 979. He was the son of Edgar and succeeded him to the throne in 975. His stepmother, Elfrida, intrigued against him in favor of her own son, Ethelred, but his right was recognized through the powerful influence of St. Dunstan. He was assassinated through the intrigues of Elfrida.

Edward I, King of England, the elder of the two sons of Henry III, born at Westminster, June 16, 1239; died July 7, 1307. In the early struggle between the nobles and his father he sided with the former, but in the war that followed he showed vigorous generalship on the side of the king. When Pope Gregory X instigated the last of the Crusades, he took part in it and landed at Acre in 1271. On learning of his father's death, he proceeded to France to do homage to the French sovereign, having been proclaimed king immediately after his father's demise, and reached England about two years later. His vigorous policy and great activity caused his reign to rank among the most important in the constitutional history of England. Soon after succeeding to the throne he directed a military

expedition against the Welsh, bringing them under subjection after a contest of nearly 10 years, the principal events being the death of Prince Llewellyn and the execution of Prince David. On account of the excessive usury practiced by the Jews, he issued a proclamation in 1290, by the terms of which 16,000 were banished from the kingdom.

The contest for the Scottish crown induced Edward to assert his claims, causing the 10 contestants to acknowledge him lord paramount of Scotland. In this way he was enabled to decide upon the rights of the competitors, and gave his decision in favor of John Baliol, in 1292, who swore fealty to him. Baliol soon renounced his allegiance and a war broke out, which resulted in Baliol's surrender and exile. To make peace with the nobles of England, he approved the Great Charter, by virtue of which the people were enabled to determine for themselves the amount of taxes to be levied. In 1297 William Wallace, a Scottish chieftain, collected a large army for the purpose of securing the freedom of Scotland, defeating the English at Stirling, but he was subdued by Edward at the famous battle of Falkirk, and was later executed as a traitor.

To adjust difficulties with Scotland, Edward prepared a new constitution, in which Scottish representation in the English Parliament was authorized, but the measure was not fully accepted by the Scots. Robert Bruce organized a powerful army in 1306, once more to battle for Scottish independence. Edward started with his army to subdue him, but died at Carlisle while within sight of the country that he had planned to subdue. He is accorded a place in history among the most liberal and enlightened monarchs of his age. The civil service, internal improvements, and rights of the people were extended largely during his reign.

Edward II, King of England, son of Edward I, born at Carnarvon, Wales, Apr. 25, 1284; slain Sept. 21, 1327. Being the first heir apparent to the throne of England, he was created Prince of Wales—the first to bear the title. He accompanied the expedition led by his father into Scotland, but returned home soon after and led a corrupt life, succeeding to the throne in 1307. His reign was influenced by favorites, among them Piers de Gaveston and Hugh le Despenser. The former was left as guardian of the kingdom in 1308, while Edward proceeded to France to conclude a marriage with Isabella, daughter of Philip V. This was so objectionable to the nobles that Gaveston was captured and hanged June 19, 1312. In 1314 Edward invaded Scotland at the head of a large army, but was defeated with great slaughter by Bruce at Bannockburn, and the Scots became independent. Soon after, Despenser began to influence Edward, which greatly weakened him



EDWARD II

with the nobles. To adjust difficulties with Charles IV of France, Edward sent his wife thither. Despising both the Despensers and her husband, she landed on the English shore with an army in 1326, defeated the king, and caused the Despensers to be executed. Compelled to resign the crown, Edward was cast in prison, and soon after was murdered in Berkeley Castle.

Edward III, King of England, son of Edward II, born at Windsor, Nov. 13, 1312; died Jan. 21, 1377. He was proclaimed king in 1327. The country was governed during his minority by a council of regency, though really by Queen Isabella and her paramour, Roger Mortimer. In 1330 he determined to assume power and accordingly put Mortimer to death, sending his unworthy mother away. Soon after, he invaded Scotland to assist Edward Baliol, and defeated the Scots at Halidon Hill. Subsequently he claimed succession of the throne of France through his mother, a sister of Charles IV, and led a powerful expedition against Philip VI, which resulted in many daring exploits. To maintain his army, excessive taxes were laid on the people and valuable concessions were made to the nobles. His eldest son, known as the Black Prince, aided materially in conquering large portions of Normandy, and in capturing the city of Calais after a siege of 12 months' duration.

The war was renewed between England and France in 1355, and the following year the Black Prince captured King John of France at Poitiers. Soon after, a peace was concluded by which Edward secured many advantages. The next war between France and England terminated disastrously to the latter country, and Edward was obliged to return home. He soon quarreled with

parliament and became at variance with the nobility, and many important functions of the government were assumed by his third son, John of Gaunt. The Black Prince died June 8, 1376, and Edward survived him about one year. His reign was quite successful, being accompanied by reforms in the national judiciary, extension of commerce, and industrial improvements.

Edward IV, King of England, son of Richard Duke of York, born at Rouen, France, Apr. 29, 1441; died Apr. 9, 1483. The contest between the two families of York and Lancaster was in full sway during his minority. At the Battle of Wakefield, in 1460, his father was slain and Edward became the natural head of the Yorkist party. The victory in the Battle of Mortimer's Cross enabled him to enter London, where he was hailed as king. His title to the throne was established by the great Battle of Towton, though Margaret, queen of Henry VI, kept up a desultory struggle in the north for some time after, which was ended eventually by the capture of her husband. His early popularity was weakened by the marriage to Elizabeth Grey, daughter of Lord Rivers, a Lancastrian, but in the battle that followed he was successful. He gave evidence of cruelty by confining Henry VI in the Tower until death and by murdering Margaret's son. His extended



EDWARD IV

EDWARD V

quarrels with parliament led to much dissatisfaction, during which he carried on the government by compelling loans from men of wealth and conducting trade with merchants' ships. In his reign, printing and the manufacture of silk were introduced in England.

Edward V, King of England, son of Edward IV, born Nov. 4, 1470. He was a lad of 13 when his father died and with his younger brother, Duke of York, was shut up in the Tower by Richard of Gloucester, who had been appointed protector of the kingdom. The two unfortunate boys were never again seen, and it is believed that they were murdered by the order of the protector. Many attempts have been made to clear him of the suspicion, but all have failed.

Edward VI, King of England, son of Henry VIII and Jane Seymour, born Oct. 12, 1537; died July 6, 1553. His short reign was marked by many important events, though they were not brought about by his influence, since his death occurred at the early age of 16. Among the events may be named the establishment of Protestantism in England, publication of the "First Prayer-Book" of Edward VI, and many reforms in internal and commercial laws.

Edward VII, King of Great Britain and Ireland, Emperor of India, eldest son of Prince Albert and Queen Victoria, born Nov. 9, 1841; died May 6, 1910. He was trained by tutors under the



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EDWARD VIII, NOW DUKE OF WINDSOR

supervision of his father, after which he attended the Univs. of Oxford and Cambridge. He made a visit to the U.S. and Canada in 1860, and two years later traveled in a number of Asiatic countries, including the Holy Land. In 1863 he married Princess Alexandra of Denmark, a daughter of Christian IX. In 1875 he made a visit to India, and traveled through various parts of Ireland in 1885. On the death of Queen Victoria, Jan. 22, 1901, he ascended the throne, declaring himself determined to maintain the constitutional form of the government. He was crowned on Aug. 9, 1902.

Edward was a lover of outdoor sports and a leader in the social life of England. He had a high standing in the councils of the Freemasons of England, of which he was elected grand master in 1874. His personal acquaintance among the courts was extensive, both in Europe and the East, and he was recognized as a factor in the politics of the world at an early period of his reign. His six children included Albert Victor (1864-92), Duke of Clarence and Avondale; George Frederick Ernest Albert (George V); Louisa Victoria, the Duchess of Fife; Victoria Alexandra; Maude Charlotte, the Queen of Denmark; and Alexander John, born and died in 1871.

Edward VIII, Albert Christian George Andrew Patrick David, Duke of Windsor, ex-King of England, eldest son of King George V and Queen Mary of England. Born at White Lodge, Richmond Park, England, June 23, 1894. In 1909 he was enrolled at the Royal Naval Coll. at Dart-



EDWARD VII

mouth, England, later becoming a midshipman. His university studies at Oxford were interrupted by World War I, during which Edward, then Prince of Wales, served with the British, Canadian, and Australian forces in Belgium, France, and Italy. In the years following the war, he enjoyed great popularity in England and abroad, having been a potent factor in cementing good will through his frequent visits to the U.S., Canada, etc.

He succeeded to the throne of England upon the death of his father in 1936, becoming the country's first bachelor king since the ascension of George III in 1760. The reign of Edward VIII, the shortest of any British monarch in over 450 years, lasting only from Jan. 20, 1936, to Dec. 11, 1936, ended with his abdication, the main cause of which was his contemplated marriage with the twice-divorced American, Mrs. Wallis Warfield Simpson. He was styled Duke of Windsor by his brother, the Duke of York, who succeeded him as George VI. He was governor of the Bahamas 1940-45. See also *Abdication, Great Britain*.

Edwards (ĕd'wēdz), AMELIA BLANDFORD, novelist and Egyptologist, born in London, England, in 1831; died Apr. 5, 1892. Among her principal novels are: "In the Days of My Youth," "Half a Million of Money," "Hand and Glove," and "Lord Brackenbury." Most noteworthy among her educational and historical works is "A Thousand Miles Up the Nile."

Edwards, JONATHAN, philosopher and theologian, born in East Windsor, Conn., Oct. 5, 1703; died Mar. 22, 1758. After securing an elementary education, he entered Yale Coll., from which he was graduated in 1720. Subsequently he became tutor at Yale and after a few years was ordained pastor at Northampton, Mass., where he remained until 1750. From 1751 until 1758 he preached as a missionary to the Housatonic Indians at Stockbridge, Mass., after which he succeeded his son-in-law, Aaron Burr, as president of Princeton Coll. His influence in the thought and life of New England was very marked, and as an original investigator of philosophy he still ranks among the most eminent of America. His personal character was one of refinement and generosity, while in theology he ranked as a rigid Calvinist. He published his famous "Inquiry Into the Freedom of Will" in 1754, which is still regarded as one of the most able productions on the subject of mental science.

Edwy (ĕd'wŷ), King of England, son of Edmund I, born about 918; died Oct. 1, 959. He succeeded his uncle Edred in 955. His reign became unpopular because of his opposition to the monasteries, on account of which St. Dunstan led the papal party in opposition and drove him from the throne of Mercia and Northumberland in 957. He was succeeded by his brother Edgar.

Eel (ēl), name of a class of serpent-shaped fishes found in nearly all rivers and seas of the warmer zones. About 50 species have been described, differing somewhat in form, but all are covered by a soft, thick, slimy skin, some having minute cycloid scales. The gill orifices are very small and are situated far back, by reason of which they can remain out of water a long time. Some species frequent the land by night in search of food. Eels prefer to live in the mud, and in cold weather bury themselves in the muddy bottom or migrate to warm and sluggish waters. They are very sensitive to cold and not found in latitudes beyond 64° 30' north or south of the Equator. They are particularly abundant near the deltas and estuaries of rivers, where the adults spawn, and in the spring immense numbers of young eels pass up streams and canals, overcoming many obstacles in their progress. They are excellent and nutritious food. The *electric eel* found in the marshy waters of the South American plains attains the length of 4 or 5 ft. and discharges a current of electricity when it is touched.

Efficiency (ē-fish'ēn-sŷ), the ratio of the useful work output of a machine to the energy input to the machine. Efficiency is customarily expressed in per cent. The friction occurring in a machine reduces the efficiency of the machine by converting a portion of the energy supplied into heat. Lubrication of the moving parts of the machine decreases the friction and increases the efficiency, but, since friction may not be completely eliminated, no machine is capable of the complete conversion of energy to useful work.

Egan (ē'gān), MAURICE FRANCIS, scholar and author, born in Philadelphia, Pa., May 24, 1852; died Jan. 15, 1924. He was graduated from La Salle Coll. and Georgetown Univ. He studied law, but soon after engaged in journalism by editing *McGee's Illustrated Weekly*. In 1881 he took charge editorially of the *Freeman's Journal* and in the meantime contributed various articles to "Appleton's Cyclopaedia." For several years he was professor of English literature at Notre Dame Univ., Indiana, and afterward taught in the Catholic Univ. of America at Washington, D.C. He was the author of many books on literature; he embodied the experience and observations of his travels in articles and published letters.

Egbert (ēg'bērt), King of Wessex, considered the first king of the united Anglo-Saxons, born about 775; died in 836. When he succeeded to the throne of Wessex in 802, England was divided into three kingdoms of Mercia, Northumbria, and Wessex, but after a struggle he made all England dependent on him. He was succeeded by Ethelwulf.

Egg (ĕg), the cell or ovum and its accompanying products which are extruded from the ovary of females of various animals, containing

the germ, origin, or first principle of life. It consists essentially of a single cell of protoplasm, in which rests the potentiality of life of an individual corresponding to the parent stock, but rarely two or more such cells are contained in the egg, when the life product is a deformity or results in more than one offspring. Reproduction in all animals is by eggs, except in the Protozoa, but in some animals the egg is incubated within the body and the new life is brought forth in a more or less immature state. Young produced in this way are said to be *born*, while those developed from eggs outside the body are said to result from hatching or incubating.

In general, the term *egg* is used only in connection with animals that do not produce their young alive; in other words, the oviparous animals. The most common oviparous animals include birds, reptiles, fishes, insects, and worms. Eggs usually contain, besides the germ, substances which serve for nourishment of the new life. In animals below the birds, the egg has only three parts, the germ, the germinal vesicle and the yolk. In the egg of birds, besides these, are a calcareous shell, a tough skin, and a considerable amount of white or albumen. When the young animal is developing, it is nourished first by the albumen and then by the yolk, both of which are consumed before it comes out of the shell.

The eggs of birds and fowls are usually oval, but a few are nearly round. In one end of the egg, between the skin and the albumen, is an air cavity which is thought to facilitate the breathing in the early stages of the new life. The outer covering of the eggs of reptiles and lizards consists of a parchmentlike membrane, while in cartilaginous fishes, such as sharks and rays, the egg is enclosed in a four-sided horny case, with tendrils projecting by which it is moored to floating seaweeds. These, after the escape of the young fish, are washed upon the shores, where they are familiarly known as *mermaid's purses*. Eggs of animals now extinct have been found in Madagascar 3 ft. in circumference, but the ostrich lays the largest egg of any animal now living.

The eggs of birds and fowls are hatched by being kept at a temperature of about 104° F. for a period of from two to four weeks. Crocodiles, alligators, and turtles bury their eggs in the sand, where they are incubated by the heat of the sun or by the warmth of decaying vegetation. Eggs of the turtle are in repute as an article of food and luxury, and those of gulls, guillemots, and wild ducks are much sought by the inhabitants of the Orkney and Shetland Islands, as well as Iceland and other northern regions. On the coast of Labrador an extensive business has developed by the eggers, who collect the eggs of sea birds and carry them to the markets of Canada and the U.S. Tremendous precipices are braved by men,

whom their companions let down by means of ropes to gather the eggs from ledges.

Birds differ greatly in the number of eggs which they lay for a *set* or *clutch*, but in this respect the individuals of the same species are quite uniform. The larger birds of prey and many waterfowl lay only one egg in the year, while others, as the hen, produce a large number. Field and woodland birds, as the robin and crow, usually lay from five to seven, while the titmouse ordinarily deposits about 10. In some instances the color is quite similar to that of the nests, but it includes white, brown, greenish, and variously spotted species. The egg of the hen is the most important as a commercial product. It consists of 73.7 parts water, 13.4 parts protein, and 10.5 parts fat. Other eggs sold on the market are those of the duck, turkey, goose, and guinea. Besides being valuable as food, eggs are used for purifying liquids and the albumen is useful in preparing photographic paper. See *Evolution*; *Nest*; *Poultry*.

Eggleston (ĕg'g'lz-tŭn), EDWARD, author and historian, born in Vevay, Ind., Dec. 10, 1837; died Sept. 3, 1902. His education included a knowledge of French, Latin, and Greek, and he became acquainted with the literature of these languages and of the German, Spanish, and Italian. He entered the Methodist ministry in 1856, and subsequently held pastorates in the Minnesota cities of St. Peter, St. Paul, Stillwater, and Winona. In 1866 he became associated with the editorial work on the *Little Corporal*, a publication for children issued at Evanston, Ill., and subsequently edited successively the *Chicago Sunday School Teacher*, *New York Independent*, and *Hearth and Home*. He was pastor of the Church of the Christian Endeavor, Brooklyn, from 1874 to 1879. His novels and historical publications portray a deep power of thought and are read extensively. Among them may be named: "The Hoosier School Master," "The Circuit Rider," "The Hoosier School Boy," "The Faith Doctor," "Eighty Famous American Indians," "The End of the World," and "School History of the U.S." His most extensive production is "People's Standard History of the U.S.," a work published in six volumes.

Eggleston, GEORGE CARY, writer, brother of Edward Eggleston, born in Vevay, Ind., Nov. 26, 1839; died Apr. 14, 1911. He studied at Indiana Asbury Univ. and Richmond Coll. (Virginia), and soon after began the practice of law. Shortly after the beginning of the Civil War, he volunteered and served in the Confederate army, and after the war engaged in journalism in New York. Subsequently he became editor-in-chief of the *Hearth and Home*. In 1875 he was made literary editor of the *Evening Post* and in 1889 became editorial writer on *The World*. His books include: "The Wreck of the Red Bird," "The

Juggernaut," and "A Rebel's Recollections."

Eggplant (*ĕg'plānt*), a plant of the nightshade family, so named because the fruit resembles an egg in shape. It is native to the tropics, but may be grown in the northern portion of the U.S. and the southern part of Canada, when planted in a hotbed. About a dozen species are cultivated for the fruit, which is cooked in a variety of ways as a table vegetable. The species that yield a purple-colored fruit are the best for general use, such as the New York purple and the black Pekin. The plant grows to a height of about 2 ft., has prickly leaves, and flowers of a violet color. The fruit varies from the size of a hen's egg to specimens from 6 to 8 in. in diameter, depending upon the season and the richness of the soil.

Eginhard (*ă'gĭn-hărt*), or **Einhard** (*ĭn'hărt*), the biographer of Charlemagne, born in East Franconia about 770; died Mar. 14, 840. He became associated with the court of the emperor at an early age, was a pupil of Alcuin, and subsequently received an appointment as private secretary and superintendent of public buildings. He accompanied Charlemagne on all his journeys and marches. After the death of the emperor, he erected a monastery at Mülheim, Germany, and gave that place the more appropriate name of Seligenstadt, meaning "City of the Blessed." Among his writings are: "Letters," 62 in number, and "Life of Charlemagne." The latter was completed about 820. It is well executed in plan, style, and language, and is considered the most valuable historical production of the Middle Ages. The work has been widely translated.

Egloff (*ĕg'lōf*), **GUSTAV**, petroleum research chemist, born in New York City, Nov. 10, 1886; died in Chicago, Ill., April 29, 1955. He studied at Cornell Univ., from which he was graduated in 1921, receiving his Ph.D. from Columbia Univ. in 1915. He was a chemist for the U.S. Bureau of Mines (1915-16) and engineer and chief chemist for the Aetna Chemical Co., Pittsburgh, Pa. (1916-17), becoming director of research for the Universal Oil Products Co., Chicago, Ill., in 1917. In the course of his career, he obtained some 300 patents on the processing of oil, shale oil, coal, and chemical derivations of hydrocarbons. Egloff was an adviser on the petroleum industry to the U.S. and foreign governments and participated in many scientific and technical congresses. He served as a delegate or official at the World Power Conferences of 1926, 1930, 1936, and 1950; the World Petroleum Congresses of 1933, 1937, and 1951; the International Bituminous Coal Conventions of 1926, 1928, and 1931; the International Congress of Chemistry, 1938; and the U.N. Scientific Conference on Conservation and Utilization of Resources, 1948. President of the American Inst. of Chemists

(1942-46), he received that organization's Gold Medal (1940), as well as many other awards and honors. Egloff wrote extensively, his books including "Earth Oil" (1933), "Isomerization of Pure Hydrocarbons" (1942), and "The Physical Constants of Hydrocarbons" (5 vols., 1939-53).

Egmont (*ĕg'mōnt*), or **EGMOND**, **LAMORAL**, COUNT OF, Dutch patriot and soldier, born in Hainault, Belgium, in 1522; beheaded in Brussels, June 5, 1568. He enlisted in the military service of Charles V and in 1541 accompanied that monarch on his expedition against Algeria. Later he served with much success in the Battle of St. Quentin under the banners of Philip of Spain, who appointed him governor of Flanders and Artois. He became popular with the people by forming an alliance with the Protestant party in The Netherlands against the Catholic policy of Philip. The strain of public feeling gradually intensified, and in 1565 he proceeded to Spain to adjust matters with Philip and secure a better understanding of the nature and needs of the administration. On returning to The Netherlands



Official Netherlands Photo

COUNT OF EGMONT

he became at variance with the Prince of Orange, which caused the latter to leave the country. Shortly after, the Duke of Alva was sent with an army to reduce the insurgents in The Netherlands, and Egmont vainly tried for some time to gain his confidence. Later Alva seized both him and Count Horn. A court tribunal instituted by Alva tried them on a charge of treason and caused them to be beheaded. The people were strongly in sympathy with Egmont, demonstrating much feeling on account of his death, and regarded him as a martyr to the cause of freedom. Goethe made Egmont a hero in one of his dramas, which inspired Ludwig van Beethoven (*q.v.*) to compose the orchestral composition, "Egmont Overture,"

first performed privately in Vienna, Austria, in 1810. It is often played as an overture to the theatrical presentation of the drama.

Ego (*ē'gō*), a term used both colloquially and in philosophy. In common use it means the individual personality which recognizes itself as a unit and wills and acts as such. Philosophy distinguishes between the Empirical Ego, the Pure Ego, the Transcendental Ego, and the Ethical Ego. In various philosophical systems it is identified with the "soul," or at least with the center of self-awareness. The definition of William James (*q.v.*) identifies the ego with the self: "The sum-total of all that the individual can call his, including both physical and mental data."

Today, Freudian psychoanalysis (*q.v.*) uses the term in contrast to the subconscious "id." Tersely outlined, Freud's concept sees the ego as the intermediary psychological unit, partly conscious, partly subconscious, between the "id" and the "super-ego."

Egoism (*ē'gō-iz'm*), a term meaning in an ethical sense the self-centered interest on one's own personality. A person directed by egoism—in contrast to altruism (*q.v.*)—thinks only of his own welfare and does not consider the interest of other individuals or that of a community.

Egotism (*ē'gō-tiz'm*), a term almost identical with Egoism (*q.v.*). Nowadays the term *egotism* is used more in a specifically philosophical sense, while the term *egoism* is more commonly applied to human character qualities in daily life. Philosophically, egotism or egoism implies the concept that every person's own interests are the motive for all his actions. Even speaking of mother love, patriotism, public interest, etc., means, in this concept, only an enlargement of our egotistic desire for pleasure or at least aversion to pain. In this sense, egotism is almost identical with the ethical hedonism (*q.v.*) of philosophers such as Epicurus (*q.v.*) and John Stuart Mill (*q.v.*).

Egret (*ē'grēt*), the name of several species of heron, especially those that have a well-developed crest during the breeding season, and whose back is adorned with long, loose flowing plumes. The American egret is about 37 in. long, measured down from the tip of the beak to the end of the tail, and the extent of the wings is 55 in. The snowy egret, native to the region bordering on the Gulf of Mexico, is a beautiful bird. It was formerly hunted for the sake of the plumes during the breeding season, and so was being rapidly exterminated until protected by law. The reddish egret is remarkable in that some birds of the same species are nearly white while others have a bluish-slate color, and it appears that the differences in color are not dependent upon sex, age, or season. Several species are native to



Courtesy U. S. Fish & Wildlife Service

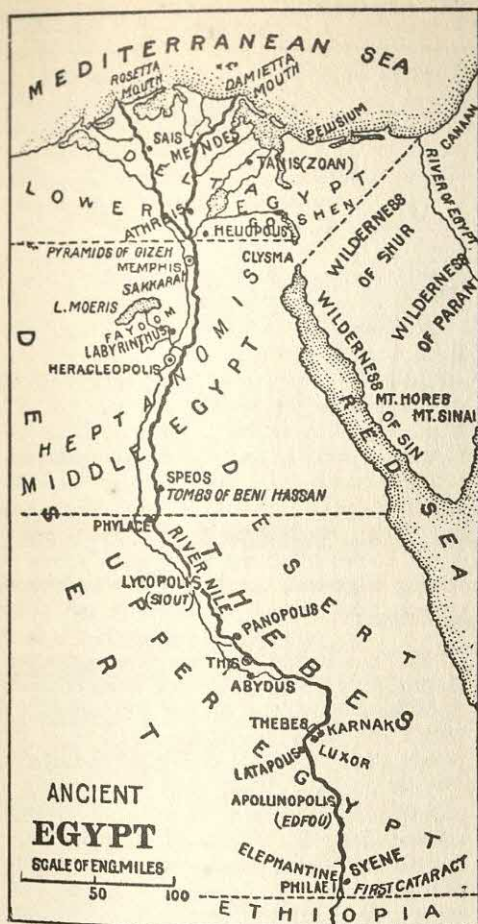
AMERICAN EGRET

Europe and Asia, including the European and the white heron.

Egypt (*ē'yīpt*), a country in northeastern Africa, politically known as the UNITED ARAB REPUBLIC. It is bounded on the N. by the Mediterranean Sea, on the E. by Israel, the Gulf of Aqaba, and the Red Sea, on the S. by the Sudan, and on the W. by Libya. It also includes the Sinai Peninsula between the gulfs of Suez and Aqaba, in Asia. Egypt covers an area of about 386,000 sq. m.

DESCRIPTION. Most of the surface consists of desert, the cultivated portion being confined to land from less than 1 m. to 10-15 m. in width along the Nile River, from just below the Second Cataract near Wadi Halfa, to Cairo, where it widens into the coastal plains along the Mediterranean. The delta area is called Lower Egypt, the rest of the Nile valley, Upper Egypt. Because of the annual inundations of the river, the lands surrounding it have produced rich yields since ancient times. This fertile district includes only about 13,500 sq. m., yet it contains almost the entire population of Egypt. The Nile flows through it from south to north with no important tributaries, a major factor in the country's aridity. West of the Nile are the barren wastes of the Libyan Desert, much of which is elevated only a few hundred feet above the sea, while many small localities are below it and derive their water by infiltration from the Nile. In the eastern part is a mountainous region, from Aswān and the ruins of Berenice in the south to Cairo and Suez in the north. The mountains cover a district about 150 m. wide and are highest near the Red Sea, where their summits approximate 7,000 ft. The

EGYPT



country south of Aswân is made up largely of sand plains and desert hills, which form the northern part of the Nubian Desert.

The course of the Nile through Egypt is *ca.* 960 m. A short distance south of Aswân is the First Cataract, the only one in Egypt, where there is a dam that regulates the supply of irrigation water, and where the Aswân High Dam is being built. The annual overflow of the Nile fertilizes the soil and makes it very productive. Usually the overflow begins in the middle of July and is occasioned by a large fall of rain in the mountains and lake region near the equator. The irrigated land begins to dry in October and the crops are sown in November, maturing in March, when they are harvested. Southwest of Cairo is a fertile tract, the depressed valley of Fayum, and near its northern extremity is the lake of Birket Qârûn, which is *ca.* 30 m. long and 5 m. wide. Many of the localities adjacent to the Nile and some of its banks are characterized by masses of rock and broken cliffs. Extensive forests are entirely unknown in the upper valley, but small clusters of trees are found in some localities.

The atmosphere is dry and the sky is clear most of the year. At Cairo the rainfall is less

than 2 in. per year, while at Alexandria, on the coast, it is about 8 in. Near the sea the temperature rarely reaches the freezing point, but the thermometer sometimes registers 114°. In April and May a large part of the country is visited by the khamsin winds, which cause a rapid rise of the temperature and fill the air with dust and sand. The sycamore is the prevailing tree and is rivaled only by the date palm. Many species of trees have been introduced and are cultivated in the regions where moisture is sufficient. The lotus, the durra, and the almost extinct papyrus are Egyptian plants. Fish are abundant in the Nile and off the coasts, and birds and insects are numerous. The fox, jackal, wild ass, leopard, lion, and striped hyena are among the wild animals.

AGRICULTURE. About two-thirds of the people are engaged in agricultural pursuits. Three crops are grown annually in the districts that are well irrigated, this being possible on account of the large amount of organic matter deposited by the waters of the Nile. Clover, wheat, barley, and vegetables grow best from December to March; sugar cane, rice, cotton, millet, and fruit thrive from April to July. The Nile Delta is the richest region and produces most abundantly. Among the tropical fruits are the orange, lemon, and fig, and the grape, pomegranate, apple, plum, and quince thrive in nearly all parts where moisture is sufficient. Raw silk is produced to some extent. The live-stock industry is on a profitable basis, and especial attention is given to the rearing of sheep, cattle, and camels. Swine are raised by the Copts, and horses and mules are quite common in the cities.

MINING. Egypt is not rich in mineral wealth, though it is possible that deposits exist which have not been discovered. Gold mines were worked anciently in the rugged mountains of Eastern Egypt and some of them have been re-discovered. Salt is obtained in the salt marshes of the Nile Delta and considerable saltpeter is manufactured. Vast deposits of limestone, granite, and sandstone were worked in ancient times, but comparatively little is done in this line at present. The material used in the construction of the great pyramids and many temples was obtained from the granite deposits near Syene, where the supply is inexhaustible.

TRANSPORTATION AND COMMERCE. Alexandria is the chief seat of foreign commerce, being favored by its location on the Mediterranean and a number of important railways. A large trade is carried on at Cairo and other points on the Nile and the Suez Canal. Inland trade is chiefly by caravans, by railways, and by transportation on the Nile, which is navigable the entire distance in Egypt. Many of the highways have been improved and are being maintained by local taxes. In 1957-58 the country had 2,698 m. of state-owned

railways, most of which are owned by the government. The Cape-to-Cairo Railway (*q.v.*) is one of the most important transportation facilities in Africa. In normal times, the largest share of foreign trade is with Great Britain; much of the rest is shared by France, Italy, and the U.S. Recently trade with India, Pakistan, and Germany has increased.

INDUSTRY. An ancient industry still extant is the weaving of linen. Other manufactures include cotton, woolen, and silk fabrics, refined sugar, glassware, vegetable oils, rugs, pottery, cigarettes, and leather goods. The chief exports are raw cotton, cotton seed, rice, mineral products, meat, hides, and fruits; imports include coal, metal goods and machinery, chemicals, lumber, and foodstuffs.

GOVERNMENT. Egypt was recognized as an independent state in 1922. A constitution of 1923 provided for a hereditary monarchy and a two-chamber parliament. In 1953, however, the monarch (infant king, Ahmed Fuad II) was deposed and a republic proclaimed. Between 1958 and 1961 Egypt was joined by Syria in the United Arab Republic (*q.v.*). Regional authority in both Egypt and Syria was vested in local executive councils. Egypt's president (incumbent, Gamal Abdel Nasser) governs under a provisional constitution, which grants him wide executive powers; he is assisted by a cabinet.

POPULATION. A majority of the inhabitants are native Egyptians of an ancient Hamito-Semitic race, but most of these are fellahs ("plowmen"), the agricultural and working classes. About 62 per cent of the total population engages in agricultural occupations. Inhabitants of non-Egyptian extraction, principally concentrated in cities, include Arabs, Greeks, Italians, British, French, Germans, and Persians. There are also semino-

madic Arabs in the desert and Nubians, of mixed Negro and Arab blood, along the upper Nile. About 92 per cent of the population is Mohammedan, of the Sunnite faith. Next in numbers are Christians (chiefly Copts), and Jews. The capital is Cairo, on the lower Nile. The principal ports are Alexandria, on the Mediterranean, and Port Said, on the Suez Canal. Other cities include Rosetta, Damietta, Suez, Tanta, Asyût, Giza, and El Mansûra. Population, 1960, 26,059,000.

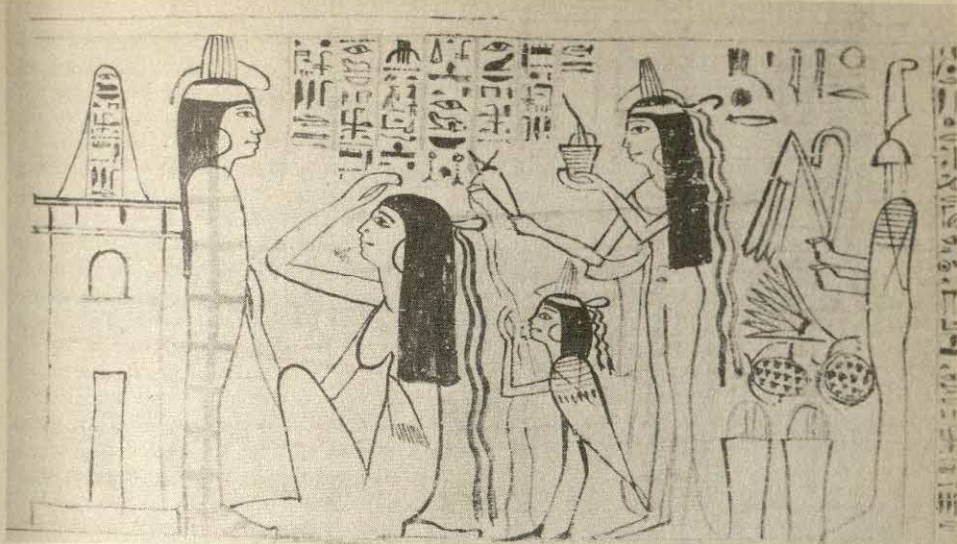
LANGUAGE AND LITERATURE. Comparatively little is known concerning the origin of the language spoken by the ancient Egyptians. It showed some affinity to the Semitic languages, but as a whole was quite distinct in its general construction. The history of the language is divided usually into four periods, including those in which prevailed the four systems of writing known as the hieroglyphic, hieratic, demotic, and Coptic. It is not known when the *hieroglyphic* system of writing originated, but there is an abundance of evidence that it was in extensive use before 3000 B.C. The principle of hieroglyphics is based on the condensation of descriptive figures into meaningful symbols; thus a sign which originally stood for a description became the symbol for a word. The *hieratic* writings are those of the priests, who simplified the original hieroglyphic symbols into more fluid signs. The *demotic*, a popular form of hieratic writing, came into literary use about the 7th century B.C. (from about 600 B.C. on). Greek letters were used frequently to write demotic words and later Semitic forms came to be added, thus giving rise to the *Coptic* language, the latest form of the Egyptian. At present it is employed only in the liturgy of the Coptic Church, and in its stead the Arabic is now in common use. See also *Rosetta Stone*.

Though the Egyptian language underwent

MURAL FROM THEBES

Egyptian sculptors and goldsmiths at work, ca. 1380 B.C.





Courtesy Metropolitan Museum of Art, N. Y.

THEBAN FUNERARY PAPYRUS

A detail from the death book of Teye, 1090-945 B.C.

marked changes, there is a notable similarity in the literature of the different periods. In the epoch of history included in the reign of the Rameses, inventive genius was especially encouraged, particularly such talent as led to the production of novels and works of amusement. However, by far the most important writings are of a historical character, especially in the late period of the Ptolemies, about 300 B.C., when the lore of the East was energized by western scholars, particularly by the Greeks.

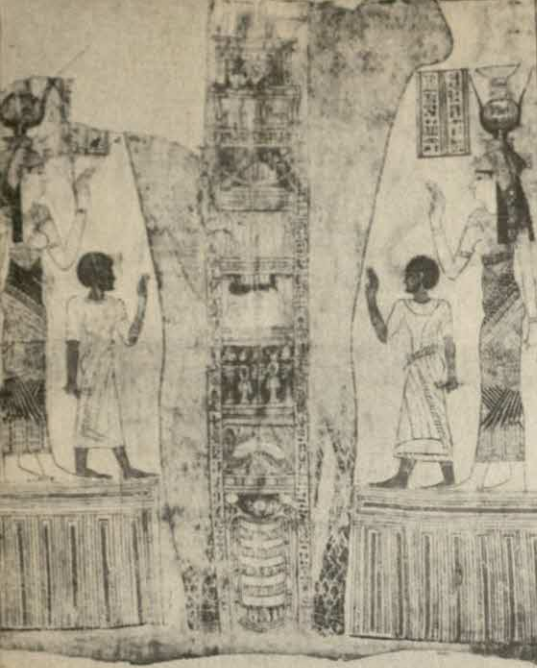
Among the Egyptian writings is an interesting work entitled "The Book of the Dead," a copy of which was found in a tomb of a queen of the 17th dynasty, which is thought to date from about 2000 B.C. It contains an account of the adventures of the soul after death, and gives directions by which it is possible to reach the hall of Osiris. The writings on astrology, moral philosophy, agriculture, medicine, physics, economics, ethics, mathematics, and poetry are numerous. A work on geometry, entitled "The Principle of Arriving at the Knowledge of Quantities," dates from about 1100 B.C.

ART. From the outset Egyptian art developed in two directions: the sacred or royal art, abstract in character, used in the execution of statues of kings, priests, and gods and the more naturalistic descriptive art also employed in statuary, specifically wooden funeral models, reliefs, and papyri describing scenes from the lives of the dead in whose burial chambers they were placed. The sacred art consisted of abstract geometric forms while the folk art was more naturalistic, although the Egyptians did not use perspective in

their paintings. The sacred art occasionally included realistic details but was never naturalistic in its total concept except during the reign of Amenhotep IV (Ekhnaton) (1375-58 B.C.) when it veered in this direction. The style of the two branches changed little from about 3000 B.C. to about 700 B.C., however. In later days when Alexander the Great (*q.v.*) had conquered Egypt, Greek and Egyptian art were fused.

The most important architectural achievement of the Egyptians was the construction of pyramids and temples. No important residential or palace structures of early Egypt are in existence. The pyramids were erected between 3000 and 2600 B.C. as burial monuments for the kings. They contain only small grave chambers and are otherwise solid closed structures. The temples, which were entered by the priests only and not by laymen, are constructed entirely of stone and their columns are distinguished by the capitals which simulate papyrus and lotus buds. The greatest temple structures were erected at the time of the Rameses dynasty during the time of the "New Kingdom" (18th dynasty). Other famous temples, such as Abu Simbel and Djer-el Bahari, were carved out of the rocks which framed the valley of the Nile.

HISTORY. No country contains greater wonders of remote antiquity than Egypt. The sphinx and pyramids are remarkable for their great size and marvelous endurance through the centuries. When Napoleon and his legions reached the vicinity of these relics, he was led to exclaim, "Soldiers, forty centuries look down upon you." The catacombs and labyrinth of Upper Egypt are



Courtesy Brooklyn Museum, N. Y.

PAINTED LINEN SHROUD

Egyptian robe adorned with figures of varied gods, ca. 200 B.C.

likewise remarkable curiosities. The labyrinth is partly under ground, cut out of marble, and originally consisted of 12 palaces and 3,000 chambers. Anciently the Egyptians possessed a wonderful civilization, and built vast palaces, monuments, and canals. They were superior as scholars and statesmen. On many of the ancient ruins are forms of hieroglyphic writings from which we have learned much of their system of mathematics, astronomy, architecture, and religion; and of their utensils, machinery, costumes, and implements of war. Their commerce was among the most extensive of the ancient world, and their civil institutions ranked with the best. Modern Egypt is but the shadow, the ruins, of a once powerful civilization.

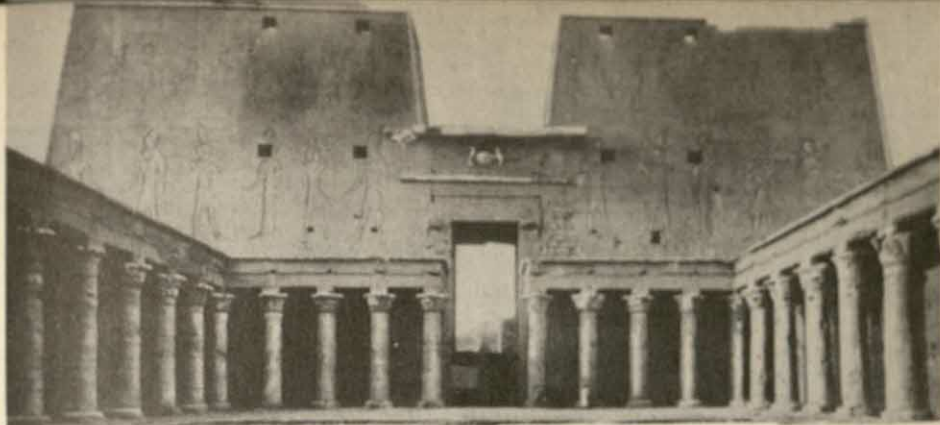
Egypt has a history extending back, according to some writers, to the year 3892 B.C., though others place its beginning about the year 5004 B.C. The priest Manetho arranged and published, in 250 B.C., a list of 30 Egyptian dynasties, and this record is still considered the best extant. In the reign of the fourth dynasty the great pyramids were built, the largest by the three kings, Cheops, Chephren, and Mykerinos—according to Lepsius, the German philologist and Egyptologist, within about the period of 2800-2700 B.C. The Pharaohs ruled the country until the Egyptians were conquered in 520 B.C. by Cambyes, King of Persia. It is thought Rameses II was the Pharaoh who oppressed the Israelites, and that the Exodus occurred in the time of his successor, Merneptah. The country was subject to Persia until Darius

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was vanquished by Alexander the Great in 322 B.C.

After Alexander's time, Egypt passed to the Ptolemies, becoming under them and Greek influence one of the most progressive kingdoms. The Ptolemies controlled it nearly 300 years, after which it was made a Roman province and kept under Roman rule for about 650 years. In 337 A.D. it became a part of the Eastern Empire, but the Romans were finally expelled by the Saracens under Caliph Omar in 640 A.D. The last dynasty of the Saracens was overthrown by the Mamelukes in 1250, who held the supreme power more than two centuries, but they were subjugated by the Turks in 1517 under Selim I, the Ottoman Sultan. During the period of Turkish rule (about 300 years), Egypt was beset with troubles. The country was torn with political strife, while famine and pestilence periodically wiped out large parts of the population.

Napoleon I conquered Egypt for France in 1798, though his army was driven out by the British and the country returned to Turkish rule in 1801. Mohammed Ali became pasha in 1805, after completely vanquishing the Mameluke chiefs, and introduced the rudiments of European civilization. He was succeeded by Said Pasha, during whose reign the French engineer, M. de Lesseps, commenced the Suez Canal, which was opened in 1869. Throughout the latter part of the 19th century both the French and the English sought to enlarge their influence in Egypt. The latter under Gen. Kitchener defeated the dervishes in the Battle of Omdurman in 1898, while Fashoda was occupied by the French, on account of which complications arose between the two nations, but all differences were settled by arbitration on Jan. 9, 1899. The terms of the treaty placed a portion of the Egyptian Sudan district under the English and a portion under the French. Egypt became independent in 1922, when Great Britain declared ended the protectorate it had established in 1914. As king, the sultan chose the new title of King Fuad I. On his death in 1936 he was succeeded by his 16-year-old son, King Farouk I. On Aug. 26, 1936, an Anglo-Egyptian treaty of alliance was signed, giving the British the right to maintain 400 pilots and 10,000 troops in the Suez Canal zone and continuing the joint condominium rule over the Sudan (*q.v.*) established in 1899. In World War II the British moved additional troops into Egypt to protect their imperial lifeline through the Mediterranean as Italian, and later German, forces struck toward the Nile from their base in neighboring Libya. Although the British were hard-pressed in the early desert campaigns, their victory at El Alamein in 1942 ended the threat to Suez and drove the Germans back toward Tunisia and their eventual North African defeat.



TEMPLE AT EDFU

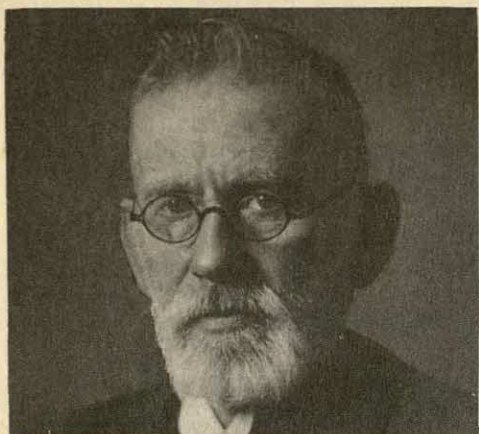
This edifice provides a perfect example of the Egyptian temple. Surprisingly well preserved, its slightly sloping walls, great size, and dignity of structure date back to Ptolemaic or Graeco-Roman times.

The end of World War II saw a resurgence of Egyptian nationalism and new demands for ending British treaty rights. In 1946 London agreed to reduce its forces in Egypt and accepted the principle of ending the occupation of the Suez base, but revision of the 1936 treaty was stalemated by lack of agreement on the future of the Sudan. Egypt, a charter member of the U.N., took the dispute to the Security Council in 1947, but the Council failed to come to an agreed recommendation. A member of the Arab League, Egypt actively opposed the creation of the state of Israel (*q.v.*). Large-scale fighting between Egyptian and Israeli forces occurred in the Negev area of Palestine before U.N. mediators succeeded in getting the two nations to sign an armistice on Feb. 24, 1949. Internal political restiveness accompanied these events, and the nationalist Wafd party came to power in 1950, bringing new demands for British evacuation. The Wafd government repudiated the 1936 treaty in 1951, and intermittent armed action against British forces in the Suez base followed. A wave of riots in Cairo in January 1952 and the turbulent political situation which existed finally resulted in an army coup, with Gen. Mohammed Naguib as its leader, in July. The upheaval brought the abdication and exile of King Farouk I (*q.v.*), the suspension of parliament and political parties and, later in 1952, the transformation of Egypt into a republic, with a transition government headed by Gen. Naguib as president. The new regime reached a settlement with Britain over the Suez Canal (*q.v.*), and, in October 1954, the two countries agreed on the withdrawal of British troops (an action completed on June 13, 1956). On Nov. 14, 1954, Gen. Naguib was ousted as president by a military junta headed by Gamal Abdel Nasser. A plebiscite in June 1956 ratified a new "custom-made" constitution and Nasser's accession to the presidency—he being the only candidate.

In the meantime, Egyptian attacks against Israel continued while U.N. mediators sought vainly for a compromise. Nasser, making himself the champion of Arab nationalism, sought and received Communist military and economic

aid. The situation was aggravated by Egypt's unilateral nationalization of the Suez Canal on July 26, 1956, and, on Oct. 29, by a retaliatory Israeli attack on the Sinai Peninsula and Gaza (*q.v.*). Egyptian forces were rapidly defeated and forced back to within 10 m. of the Suez Canal. Because of this warlike situation, Anglo-French forces landed near the canal to insure its use as an international waterway. A complete military disaster for Egypt was prevented by U.N. intervention and the withdrawal of the foreign forces during the winter of 1956-57. During the invasion, Egypt blocked the canal by voluntarily scuttling several vessels, but U.N. salvage teams cleared the waterway, which was reopened to traffic in April 1957. Later, Egypt again took up normal relations with Great Britain and France and reimbursed Suez Canal stockholders but refused to enter into an agreement with Israel. As a consequence of the Suez affair, Nasser, who had gained added prestige, helped the Soviets to widen their penetration of the Middle East. Striving for Arab unity under Egyptian domination, Nasser, by means of threats, accomplished a merger with Syria in the United Arab Republic (*q.v.*) in 1958. However, a *coup d'état* ended this relationship in 1961, and Syria subsequently regained her independence.

Egyptology (*ê-jép-tôl'ô-jî*), a science devoted to the recovery and study of the life, language, history, and achievements of the ancient Egyptians. Knowledge of their language, fundamental to the science, was lost with the spread of Christianity, and no decipherment was made until the trilingual Rosetta Stone (*q.v.*) was discovered in 1799. This, and a bilingual inscription, enabled Thomas Young and J. F. Champollion (*q.v.*) to read the alphabetic signs in several royal names. Knowledge of Coptic, the old language written by the Christians in Egypt, then enabled Champollion to decipher further and to write a grammar. Scholars have since widened knowledge of the ancient language and literature; and monuments and antiquities have been excavated and studied to broaden the picture. The Service des Antiquités, the French, German, and Austrian



PAUL EHRLICH

institutes in Cairo and Vienna, the Fondation Égyptologique in Brussels, the Society of Biblical Archaeology, the Egypt Exploration Society, and the British School of Archaeology in Egypt, in London, the Oriental Inst. in Chicago, and museums and universities throughout the world promote such studies, undertake excavations, and publish journals and reports in the field.

Ehrenbreitstein (*ä-rən-brī't'stīn*), a former town and a fortress in the *Land* Rhineland-Palatinate, Germany, on the Rhine, opposite Coblenz (*q.v.*), of which it now forms a part. The structure of the former fortress stands *ca.* 400 ft. above the river and is inaccessible from three sides. The town lay at the foot of the cliff.

Ehrenburg (*ä'rən-bürg*), ILYA GRIGORIEVICH, writer, born in Kiev, Russia, Jan. 27, 1891. A revolutionary in his youth, he fled to Paris (1909), remaining there until the end of the Russian Revolution (1917). He again lived in Paris from 1921 to 1940. In World War II he was prominent as a war correspondent with the Red Army. After the war he became one of the leading Communist propagandists, but he was often accused of neglecting the party line. Two of his novels won the Stalin Prize: "The Fall of Paris" (1942) and "The Storm" (1949). His "The Thaw" appeared in 1955.

Ehrlich (*är'lik*), PAUL, bacteriologist, born in Strehlen, Germany, March 14, 1854; died in Homburg, Aug. 20, 1915. His extensive research in blood histology and immunology won him the 1908 Nobel Prize for medicine, which he shared with Élie Metchnikoff (*q.v.*). Ehrlich discovered a process by which living nerves and the tuberculosis bacillus could be stained, and a treatment for syphilis in the substance called salvarsan (*q.v.*).

Eichelberger (*i'kel-bēr-gēr*), ROBERT LAWRENCE, U.S. general, born in Urbana, Ohio, March 9, 1886; died in Asheville, N.C., Sept. 26, 1961. He grew up on an Ohio farm where his father, a lawyer, raised horses. He studied at Ohio State Univ. (1903-05), and was graduated from the U.S.

EIFFEL

Military Acad. (1909), the Command and General Staff School (1926), and the Army War Coll. (1930). He returned to the U.S. Military Acad. as adjutant general (1931-35) and as superintendent (1940-42). He served on the Mexican border (1911), in the Panama Canal Zone (1911-15), in Siberia (1918), in China and in Japan (1920-21), and was liaison officer with the Chinese delegation to the Limitation of Armaments Conference (1922). He was a member of the U.S. General Staff (1921-24) and secretary of that body (1935-38). In World War II he commanded the "amphibious" U.S. Eighth Army in the Pacific, inflicted the first land defeat of the war on the Japanese at Buna, New Guinea (January 1943), and made more than 55 invasion landings. He showed unusual stamina, cunning, and methodical determination and frequently visited among his troops under direct fire. He retired from the army with the rank of full general in 1950. In the same year he published "Our Jungle Road to Tokyo."

Eichendorff (*i'ken-dōrf*), JOSEPH, BARON VON, writer, born near Ratibor, Prussia, March 10, 1788; died in Neisse, Nov. 26, 1857. After studying law (1805-08) at Halle and Heidelberg, he served (1813-15) in the Prussian army. During his long career (1816-44) in government service, he published the great body of his works, consisting of romances and tales, lyric and narrative poems, and romantic tragedies and comedies. His story "*Aus dem Leben eines Taugenichts*" (1826; trans., "Memoirs of a Good-for-Nothing," 1866) is considered outstanding among German romantic narratives. Many of his lyrics were set to music by Hugo Wolf and Robert Schumann.

Eider Duck (*i'dēr*), a species of large sea duck which inhabits arctic and subarctic regions. The male eiders are handsome black-and-white birds with green feathers on the head or neck. The females are plain brown in coloring. Like all ducks, the eiders pluck down from their breasts to line their nests, but the eiders provide a more plentiful supply of down because of the extreme cold of their surroundings. The down, an excellent insulator, is used in some countries to fill bed quilts and to make warm clothing.

Eiffel (*i'fēl*), ALEXANDRE GUSTAVE, engineer, born in Dijon, France, Dec. 15, 1832; died in Paris, Dec. 27, 1923. After graduation (1855) from the École Centrale des Arts et Manufactures in Paris, he began his career as a structural engineer. He constructed an iron bridge over the Garonne River at Bordeaux (1858) and, later, a railroad bridge over the Douro at Oporto, Portugal. He also built the framework for Bartholdi's Statue of Liberty (*q.v.*). His best-known engineering feat was the construction of the Eiffel Tower on the Champ-de-Mars, (see *Paris*), completed in 1889, for the Paris Ex-

position. The total height of the tower is 984 ft. and the weight of iron used in its construction aggregates 7,325 tons.

Eight, *THE* (*āt*), the name of a group of eight American artists, including John Sloan, Arthur B. Davies, William J. Glackens, Robert Henri, Ernest Lawson, George Luks, Maurice Prendergast, and Everett Shinn, who in 1908 exhibited their work in New York City. Their aim was to break with the European tradition of the National Acad. of Design and to stress American themes and treatment in painting. The group formed the nucleus of the Society of Independent Artists, founded in 1917, with John Sloan as its first president.

Eight-Hour Day (*āt our dā*), the maximum daily period of work that has been adopted in many industrialized countries. Beginning in 1833 when a law was passed in England limiting the working day for children under 13 to eight hours, the eight-hour day was gradually adopted in the latter half of the 19th and first half of the 20th centuries. By the 1920's almost all the states of the U.S. and many European countries had made eight hours the maximum daily work period for public workers. See also *Fair Labor Standards Act*; *Overtime*.

Eijkman (*ik'mān*), CHRISTIAAN, scientist, born in Nijkerk, The Netherlands, Aug. 11, 1858; died in Utrecht, Nov. 5, 1930. After serving as director of a pathological institute in Java (1888-96), he was professor of hygiene at the Univ. of Utrecht (1898-1928). He discovered that beriberi (*q.v.*) is a nutritional disease and that rice, when polished, loses an important nutrient and hence gives rise to a deficiency disease. He shared the 1929 Nobel Prize in medicine with Frederick G. Hopkins (*q.v.*) for the discovery of thiamine.

Eilshemius (*il-she'mī-ūs*), LOUIS MICHEL, painter, born in Arlington, N.J., Feb. 4, 1864; died in New York City, Dec. 29, 1941. After studying in New York and Paris, he exhibited in Europe and the U.S. His paintings include "Children in Central Park," "Low Tides," "Storm Clouds," and "Morning."

Eindhoven (*ind'hō-vēn*), a city in North Brabant province, The Netherlands, situated on the Dommel River, ca. 18 m. S.E. of Tilburg. It is an industrial center, manufacturing radio and electrical appliances, heating apparatus, cigars and cigarettes, textiles, bicycles, leather, glass, matches, and soap. Eindhoven was chartered in 1232. In World War II it was captured by U.S. airborne troops in September 1944. Population, ca. 145,000.

Einhard (*in'härt*), scholar and biographer, born in Austrasia, ca. 770; died in Seligenstadt, Germany, probably on March 14, 840. He was educated at the monastery of Fulda and ca. 796 went to the court of Charlemagne (*q.v.*), where he was appointed minister of public works and was later sent to Rome as imperial legate. He wrote a fa-

mous biography of Charlemagne, "*Vita Caroli Magni*."

Einsiedeln (*in'zē-dēln*), a town in Schwyz canton, Switzerland, 8 m. N.E. of Schwyz. Famous as a pilgrim center, its 9th-century Benedictine abbey has an 18th-century church containing a black-marble altar. Population, ca. 8,400.

Einstein (*in'stīn*), ALBERT, theoretical physicist, born in Ulm an der Donau, Germany, March 14, 1879; died in Princeton, N.J., April 18, 1955. Educated in Munich, Germany, and Aarau and Zurich, Switzerland, he taught at Zurich and Prague between 1909 and 1914, when he was called to Berlin. He was professor of physics at the university and director of the Kaiser Wilhelm Physical Inst., 1914-33. He joined the Inst. for Advanced Study, Princeton, N.J., in 1933, where he was professor of theoretical physics until 1945. He became a U.S. citizen in 1940. He received the Nobel Prize in physics in 1922.

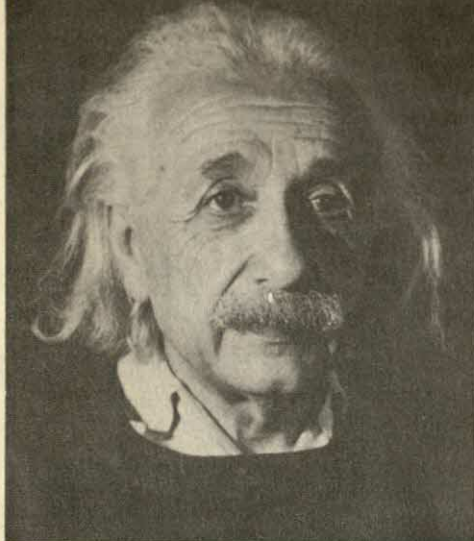
His formulation of the theory of relativity was expressed first in a paper, "On the Electrodynamics of Moving Bodies" (1905). Appendix II to "The Meaning of Relativity," which set forth a new generalized theory of gravitation, was published in 1950. In it Einstein proposes a unifying link between the two major cosmic forces, electromagnetism and gravitation. In 1953 he announced a new "unified field theory," formulating laws supposed to govern the operation of the universe.

Among his other books are "The Meaning of Relativity" (1923), "Builders of the Universe" (1932), "On the Methods of Theoretical Physics" (1933), "The World As I See It" (1934), and "Out of My Later Years" (1950). See *Einstein Theory*.

Einstein, ALFRED, musicologist, born in Munich, Germany, Dec. 30, 1880; died in El Cerrito, Calif., Feb. 13, 1952. A music critic in his native country, he came to the U.S. in 1939 to teach at Smith Coll. (1939-50). His most important contribution to music in his revision of Ludwig von Köchel's catalogue of Mozart's works. He published a number of books on music and musicians, including "The Italian Madrigal" (1949).

Einstein Theory, a theory of the relativity of time and space formulated in 1905 by Albert Einstein (*q.v.*).

The stimulus for the development of the special theory of relativity was an experiment performed in 1887 by Albert A. Michelson and Edward W. Morley. This experiment represented an attempt to define the motion of the earth through the ether, the medium through which the light waves were supposed to move. The calculation based on this experiment, which failed to find the theoretically expected drift, led Einstein to propose a theory which discarded the notion of absolute time and space and substituted the idea of relative time and space. This meant that to every observer a different system of time



Courtesy T. Fleischmann, N. Y.

ALBERT EINSTEIN

and position applied. Two events would appear simultaneously or two positions would coincide for two observers only when they were at rest with respect to each other. The basic assumption of the special theory of relativity was that the speed of light was the same to every observer in accordance with the result of the Michelson-Morley experiment. Although this assumption in itself was not radical, startling deductions were possible from it. Among these deductions, the variation of the mass of a body in relation to its speed and the identity of mass and energy were the most interesting.

By 1901, it was known that the mass of an electron increased as its speed approached that of light. The discovery of radioactive materials also demonstrated that the energy given off by these materials was vastly greater than could be explained, unless the inner structure of the atom contained tremendous binding energy. From the relativity theory, Einstein expressed the relationship between mass and energy in the following mathematical equation:

$$E = mc^2$$

where E is the energy in ergs contained in a body; m is its mass in grams, and c is the velocity of light (186,000 m. per second, or 2.997776×10^{10} centimeters per second). This energy is contained within the atom. Parts of it are known to be released in radioactive materials. Thus in the fission of uranium ($q.v.$), the fission fragments add up to less than the original mass. The difference between the sum of the fragments and the original mass is the amount of mass which has been converted into energy in accordance with the above formula.

In 1919, Einstein brought forth a general theory of relativity. This theory connected gravitational forces intrinsically with the properties of space. Thus space was divested of its absolute

EISENACH

significance and took properties dependent upon what was contained in space. The type of space contemplated for the universe was a finite but unbounded region in which light waves might make a complete circuit and retrace their path. Matter had the property of influencing the dimensions of space and thus of attracting light rays. While the implications of the general theory of relativity have not been subjected to exhaustive test, Albert Einstein's ideas have given rise to a great deal of mathematical investigation and philosophical speculation. The revolutionary phenomenon in these speculations is the abolition of time and space ($q.v.$) as basic and fundamental entities of human perception. See also *Atomic Energy*.

Discovery of the Mössbauer Effect, by Dr. Rudolf L. Mössbauer in 1958, provided a new tool for verification of Einstein's prediction that light would lose energy in a gravitational field. In this effect, gamma rays were so confined within a crystal that they could be discharged without recoil, thus becoming rays with sharply defined wave lengths, unblurred by the loss of energy to recoil. Later, it was found possible to measure and verify the influence of gravitational fields upon these definitive rays, when their ability to excite other gamma rays within crystals was affected.

Eindhoven (*int'hō-ven*), WILLEM, physiologist, born in Semarang, Java, May 22, 1860; died in Leyden, The Netherlands, Sept. 29, 1927. The son of a physician in the Dutch colonies, he was sent to Europe and educated in Utrecht. He was appointed professor of physiology at the Univ. of Leyden and remained there until his death. Eindhoven was awarded the 1924 Nobel Prize for medicine and physiology for his invention of the string galvanometer, which is used in the electrocardiograph (an instrument which records the electric current produced by the movement of the heart muscle). His discovery has been of major importance in diagnosis of heart disease but has also been applied, with significant results, to radio reception.

Eire (*ār'ē*), the Gaelic name of Ireland ($q.v.$) and from December 1937 to April 1949 the official designation of the area previously known as the Irish Free State ($q.v.$), following the proclamation of a constitution (Dec. 29, 1937) which declared Eire a sovereign, independent, democratic state. Connections with the British Commonwealth of Nations were not completely severed until passage (1948) of the Republic of Ireland Act (effective April 1949).

The National Parliament consists of the President of the Republic, a House of Representatives, and a Senate.

Eisenach, (*i'sen-āk*), a city of Germany, on the northwestern limit of the Thuringian Forest. Johann Christian and Johann Sebastian Bach,

members of the famous family of musicians, were born here. Its famous castle, Wartburg, was built in 1067 on an elevation 600 ft. above the city. Martin Luther occupied the castle as a refuge for 10 months (1521-22). The chapel in which Luther preached, the chamber he occupied, and the point struck by the inkstand he allegedly threw at the head of the devil are still shown. After the surrender of Germany in World War II, the city passed under Russian occupation. Population, ca. 50,000.

Eisenhower (*iz'n-hou-er*), DWIGHT DAVID, 34th President of the U.S., born in Denison, Tex., Oct. 14, 1890. The third of seven children of David Jacob and Ida Elizabeth (Stover) Eisenhower, he attended school in Abilene, Kans., where his family moved in 1892. He was graduated from the U.S. Military Acad. in 1915. In 1916 he married Mamie Geneva Doud; their son Dwight Doud died in infancy; their second son, John Sheldon Doud, is a career Army officer.

An outstanding military career brought Gen. Eisenhower to the White House. An honors peacetime graduate of Army schools, he rose during World War II from a temporary brigadier general in charge of the war plans division of the Army general staff to Supreme Allied Commander in Europe. His first combat command was over U.S. forces in the successful invasion of North Africa (Nov. 8, 1942). Later, as a lieutenant general commanding all Allied forces in North Africa, he showed diplomatic skill in achieving inter-Allied agreement on plans and action.

He needed these skills after his selection, on Dec. 31, 1943, to command Allied forces in Europe. He was named to the top rank of general of the army soon after he forged the massive D-day invasion of June 6, 1944, which broke into Adolf Hitler's "Fortress Europe" from the West and led to unconditional German surrender on V-E Day (May 8, 1945).

After the war, Gen. Eisenhower served briefly as U.S. military governor of Germany, then was named Army chief of staff on Nov. 19, 1945. In that post, he helped achieve service unification. In 1948 he accepted the presidency of Columbia Univ. but went on leave in 1950 to head North Atlantic Treaty (*q.v.*) forces in Europe.

Mentioned by both U.S. political parties as a Presidential prospect, he resigned his commission in June 1952, to seek and win the Republican nomination. On Nov. 4 he defeated the Democratic nominee, Adlai E. Stevenson (*q.v.*), by a 442-to-89 electoral college victory. He ran against Stevenson again for a second term in 1956 and won by 457 electoral votes to 73. However, the Republican party lost control of Congress in 1954, and the President served six years thereafter with



DWIGHT D. EISENHOWER

President Eisenhower signs (March 9, 1957) the joint resolution of Congress, known as the Eisenhower Doctrine

Democratic majorities in control of both houses. His personal popularity and his willingness to compromise forestalled any serious break with the majority party.

In foreign policy, the President's earliest efforts went toward liquidation of the war in Korea (*q.v.*). He sought a formula for peace as he worked to halt Communist expansion by building the free world's strength. Alliances linked the U.S. with non-Communist nations on three continents. They were reinforced with the shield of U.S. nuclear power and directly strengthened through U.S. military and economic aid for which Eisenhower helped win congressional support. The Eisenhower Doctrine of 1957 committed U.S. forces to defend the Middle East against Communist aggression. In 1954 the President proposed an international "atoms-for-peace" plan. He urged mutual aerial inspection as a basis for disarmament at the 1955 summit conference, where the President and other Western leaders met with Soviet Premier Nikita S. Khrushchev (*q.v.*), but there were no grounds for a stable accord with the U.S.S.R. Khrushchev conferred with the President again when he visited the U.S. in 1959 but openly attacked him over the U-2 "spy" plane incident that disrupted the 1960 summit meeting in Paris, France, in May.

Soviet rocket development threatened U.S. nuclear deterrent power during the second Eisenhower term. In 1957 Moscow announced an operational intercontinental ballistic missile capable of carrying a nuclear warhead, and later Russia

launched the first earth satellite (*q.v.*). The U.S. missile program was stepped up for a counter-effort in the race to conquer space.

The Eisenhower administration expanded on some of the social reforms of the New and Fair Deals, notably social security (*q.v.*). But the emphasis was on limitation of Federal spending—including military outlays—and encouragement of state and local responsibility for social services. It supported moderate civil-rights legislation, and troops were sent in 1957, to halt rioting against school integration in Little Rock, Ark.

Eisenhower won his second-term victory despite a coronary thrombosis suffered in 1955 and an ileitis operation in 1956. Much of the burden of his second campaign was carried by Vice President Richard M. Nixon (*q.v.*), his running-mate in both elections. After the inauguration of his successor, John F. Kennedy (*q.v.*), Eisenhower retired to his farm near Gettysburg, Pa., but remained active in political affairs, urging, primarily, responsible management of Federal fiscal affairs. His rank of General of the Army, which he had resigned in 1952, was restored in 1961.

Eisenstein (*ʔɛn-stin*), SERGEI MIKHAILOVICH, Russian theatrical and moving-picture director, born in Riga, Latvia, in 1898; died in Moscow, U.S.S.R., Feb. 10, 1948. Producer for the first Russian workers' theater, and the originator of new motion-picture techniques, he was widely acclaimed as one of the world's outstanding directors. He made films in Hollywood and Paris as well as in Russia and was responsible for such outstanding examples of cinema art as "Potemkin," "Alexander Nevsky," and "Ten Days that Shook the World."

Eisteddfod (*ɛs-tēTH'vōd*), an annual gathering of Welsh bards for music and poetry contests, originally held in Wales in localities convenient to the participants but recently revived by the Gwynedigion and Cambrian societies wherever there are large settlements of Welsh people. The ancient rites were last commissioned by Queen Elizabeth I in 1568. The recent revivals, chiefly for the playing of the harp and reciting of poetry, strictly follow the original ceremonies.

Ekaterinburg (*ɛ-kāt'ēr-in-bŭrg*), a city in the U.S.S.R. See *Sverdlovsk*.

Ekaterinodar (*ɛ-kāt'ēr-ē'nō-dār*). See *Krasnodar*.

Ekron (*ɛk'rōn*), modern AKIR, an ancient city of Palestine, situated on the Jaffa-Jerusalem railroad. The territory is fertile, and a Jewish colony was established there in 1884. In the days of Samuel, it was occupied by the Philistines and was the site of the sanctuary of Beelzebub. It was ceded to the Maccabees in 147 B.C. and became the home of many Jews after the destruction of Jerusalem in A.D. 70.

El Alamein (*ɛl ăl'ā-mān*), a town in northern

Egypt, on the Mediterranean coast, ca. 60 m. w. of Alexandria. It was the scene of one of the decisive battles of World War II. It was here that British forces under Gen. Montgomery defeated German and Italian forces under Gen. Rommel and stemmed the southward advance of the Axis forces, saving the Suez Canal for the Allies.

Elam (*ɛ'lām*), an ancient country of Asia, situated at the head of the Persian Gulf, and known to the Greeks as Susiana or Cissia. The country formed a part of the ancient Persian empire and comprised the great plain east of the lower Tigris. It contained the Zagros and Pushti Mts. Susa (*q.v.*), or Shushan, was its chief city. Apparently the Elamites were a non-Semitic warlike people, and the evidence is that they defeated the Babylonians sometime during the 18th century. The best years of the Elamite civilization were from about 1200 to 640 B.C. At that time, Elam was conquered and Susa razed by the Assyrians. After the fall of the Assyrian empire, Elam was occupied by Persia, and Susa became one of the three seats of the Persian government.

Eland (*ɛ'land*), a Dutch word meaning "elk." Of the genus *Taurotragus*, the eland is the largest of the antelopes, rather oxlike in appearance, and native to Africa. The common eland frequents grassy plains, in herds, from Kenya to South Africa, has long, straight, spirally twisted horns, directed backward. The coat is pale fawn colored, with a few white, vertical stripes; old bulls are blue-gray, and a heavy fold of skin hangs from the neck. The Giant or Derby's Eland frequents wooded regions from Senegambia to the Sudan and Portuguese Guinea in West Africa, is more reddish in color than the common eland and has more white vertical stripes. Large bulls weigh 1,200 lb. and stand 6 ft. at the shoulder; the cows are smaller.

The breeding season extends from March into May; the young are born 256 days after mating. The eland grazes on green grass and browses on leaves and twigs of trees.

Elasticity (*ɛ-lās-tis'i-tē*), the ability of a body to regain its shape after it has been deformed. For instance, a rubber ball, when pressed, will change its shape, but it returns to its original shape when the force is withdrawn. The elastic force with which the ball regains its shape causes it also to bounce when thrown against a wall or the floor.

Those materials like dough, or putty, that do not regain their shape when deformed, are said to be inelastic. But many materials, e.g., iron and glass, are elastic. Although it takes a strong force to cause even a small change in the shape of such materials, they regain their original shape completely when the force is withdrawn; these materials are therefore said to have perfect elasticity. A thin piece of glass, steel, or ice can be bent and will regain its shape elastically. Steel balls bounce

if dropped on a steel surface, and the elastic behavior of a steel spring is familiar to everybody.

Liquids and gases, as well as solids, can be subjected to compression forces. Water can be compressed very slightly, and it recovers its original volume completely. Gases, in accordance with Boyle's law, are far more easily compressed, and they, too, show perfect elasticity (see *Chemistry: THE GASEOUS STATE*).

Solids can be pulled, or placed in torsion (meaning the twisting of a solid), as well as compressed. A rubber band, when stretched, regains its shape elastically. A fine quartz fiber is remarkably elastic under torsion, a fact made use of in many scientific instruments. See also *Stress*.

Elba (*ēl'ba*), an Italian island, situated in the Mediterranean, between Corsica and the Italian mainland. The 86-sq.-m. island, part of the province of Leghorn, is traversed by a mountain range, the highest elevation being 3,350 ft. above sea level. The coast is rugged and precipitous, the mountains are bare, and the valleys and lowlands produce fruit, wheat, maize, vegetables, and watermelons. Iron of an excellent quality has been the main source of income since ancient times. The island is famous in history for having been Napoleon's place of exile from May 4, 1814, to Feb. 26, 1815. Portoferraio is the capital and principal port. Population, 1946, 31,441.

Elbe (*ēl'be*), an important river of Europe, rises in northeastern Czechoslovakia and flows northwesterly through Germany, entering the North Sea at Cuxhaven. It is navigable for seagoing vessels from its mouth to Hamburg, about 85 m., and for smaller vessels a distance of 525 m. The total length is 725 m. Among its principal tributaries are the Havel, Mulde, Moldau, Saale, and Eger. Extensive dredging and canal and dam constructions have vastly increased its trade, making longer sections navigable and permitting larger vessels to navigate the river. The Elbe is noted also for its plentiful supply of fish. In World War II the U.S. and Russian armies met on the Elbe near Torgau, April 27, 1945.

Elberfeld (*ēl'bēr-fēlt*), a city in Germany. See *Wuppertal*.

Elblag (*ēl'b'lāg*), formerly ELBING, a city in the Gdansk department of northern Poland, before 1945 part of East Prussia, Germany. It is situated on the Elblag River, near the Frisches Haff (lagoon). It is an important port and railroad center, has large shipyards, and is a trading center for farm products, livestock, and plywood. Points of interest include several 13th-century churches, the market place, and an ancient gate. Founded in 1237, Elblag was a member of the Hanseatic League. Becoming part of Poland in 1945, it was taken by Prussia in the first partition of Poland (1772). In World War II it was held by the Russians, February-August 1945,



Courtesy Czechoslovak Information Service, N. Y.

VIEW OF THE ELBE RIVER IN CZECHOSLOVAKIA

when the Potsdam Conference turned it over to Poland. Population, 1947 (est.), 89,952.

Elborus (*ēl-bō-rōōz'*) or ELBRUS, a mountain in the Caucasus range, in the Georgian Soviet Socialist Republic. With an altitude of 18,481 ft., its west peak is the highest in the Caucasus and in Europe.

Elburz Mountains (*ēl-bōōrz'*), a range in northern Iran, 50 m. N.E. of Teheran, lying parallel to the southern coast of the Caspian Sea. Its peaks range from 8,000 ft. to 14,000 ft. with Mt. Demavend, the highest, having an altitude of 18,600 ft.

El Caney (*ēl kā'nī*), BATTLE OF, an engagement (July 1, 1898) of the Spanish-American War. The Spaniards had a force of about 520 men at the town of El Caney, 4 m. from Santiago de Cuba, and were commanded by Gen. Vara del Rey. General Lawton, with about 4,500 Americans, made the attack and met with desperate resistance, but the Spaniards were defeated. The Americans lost 423 men and the Spaniards lost about 400, including 100 prisoners.

Elder (*ēl'dēr*), a large shrub or tree found in both hemispheres, including several species. Most species have pinnate leaves and a small creamy-white flower, which clusters in terminal cymes and usually appears in June. The berries are nearly black and are used to make a kind of wine. They are considered wholesome food, especially in the form of pies and jellies. The wood of the tree is yellowish, takes a fine polish, and is used in making mathematical instruments. Young shoots of the elder have a very large pith, which, when pushed out with a rod, leaves a hollow cylinder and in this form are used by boys in making popguns. The pith, being very light, is employed for various electrical experiments.

Elder, an official in some Protestant churches, who may be either an ordained minister or a layman having duties within the church. In some Methodist churches the elder is any fully ordained

minister. In the Mormon Church the elder is one who is ordained to the Melchizedek, or higher, priesthood and who has authority to officiate in any of the duties of the Aaronic, or lower, priesthood. In addition to these duties he performs baptisms, ordains other elders, priests, and teachers, blesses children, bestows the Holy Ghost by the laying on of hands, and takes the lead in meetings. There are two types of elders in the Presbyterian Church: teaching elders, or ministers; and ruling elders, or laymen who share in the government of the church (see also *Presbytery*). The Shakers have four elders, two male and two female.

Eldon (*ĕl'dŭn*), JOHN SCOTT, BARON, statesman and jurist, born in Newcastle, England, June 4, 1751; died Jan. 13, 1838. Son of a merchant, educated in the Newcastle grammar school and at Oxford Univ., he studied law and became an attorney. In 1782 he entered the House of Commons, and was knighted and appointed solicitor general in 1788. Five years later he became attorney general and, in 1799, chief justice of the court of common pleas. In 1799 he entered the House of Lords as Baron Eldon and two years later he became lord chancellor, a post which he kept for nearly 26 years. The rank of earl was bestowed on him by George IV in 1821. In politics an ultraconservative, he opposed Parliamentary and other reforms. He was an able jurist, though known for his habit of delay and application of excessive "red tape."

El Dorado (*ĕl dŏ-ră-dŏ*), a Spanish term, meaning literally "the gilded man," which has come to mean the gilded, or golden, land. The term was originally applied by Spaniards in the 16th century to a legendary king in South America who was supposed to have been fabulously wealthy. Subsequently, the term was applied to his kingdom, and finally it was applied to any fabulously rich place. During the 16th century Spanish explorers undertook numerous expeditions in South America in search of El Dorado. Among these explorers was Francisco de Orellana, Pizarro's lieutenant, who sailed down the Amazon in 1540 and reported the discovery of a region having immense quantities of precious metals. In 1595 Sir Walter Raleigh explored Guiana in a vain attempt to find the legendary region and the imaginary city of Manoa. The legend of El Dorado probably had its origin in the stories told to the Spanish explorers by the Indians.

El Dorado, county seat of Butler County, Kan., 135 m. s.w. of Topeka, on the Atchison, Topeka & Santa Fe and Missouri Pacific R.R.'s. It is situated on the Walnut River and is surrounded by a farming and oil-producing country. The industries include flour mills, oil refineries, limestone quarries, and machine shops. El Dorado has a number of fine schools and several county

buildings. First settled in 1858, it was incorporated in 1870. Population, 1940, 10,045; in 1950, 11,037.

Elecampane (*ĕl-ĕ-kăm-păn'*), a plant closely allied to the aster, native to Europe, and naturalized in various parts of North America. It attains a height of 3 or 4 ft., has root leaves about 2 ft. long, and bears large yellow flowers. The root has an agreeable aromatic odor when dried, somewhat like that of camphor, and is used in medicine as a tonic and stimulant, especially in chronic diseases of the lungs. Several species are cultivated in gardens for their orange-colored flowers.

Election (*ĕ-lĕk'shŭn*), the process of selecting one or more persons for office or making a decision by votes.

A public election to decide on a special measure is usually called a "referendum" or "plebiscite." An example is the popular vote required in nearly all states of the U.S. to ratify amendments to a state constitution. In several states and many cities proposed laws or ordinances may be submitted to the people by petition. See also *Referendum*.

Elections to choose officers and representatives are the foundation of all democratic governments. All public servants not chosen by election are appointed directly or indirectly by those who are so chosen.

The President (*q.v.*) of the U.S. is elected every fourth year on the first Tuesday after the first Monday in November. Many other officers, Federal, state, and local, are elected on this same day throughout the country every year. This regular annual election is usually called a "general election." Many local elections, and even Congressional elections in Maine, are held regularly at times other than the general election. An election held for a particular purpose which does not recur regularly is called a "special election." Preliminary elections to weed out the weaker candidates before the final election are called "primary elections" or "primaries."

In the U.S. the regulations for holding elections are largely determined by the states. A few general requirements are prescribed by the U.S. Constitution, such as the right of women and citizens of all races to vote, and by act of Congress, such as the number of Representatives in Congress to be chosen by each state. A number of states have given home rule to cities and some other municipalities in the methods of choosing their local officials. See also *Congress*; *Municipal Government*.

In most American public elections all citizens 21 years of age or more who meet certain residence requirements and are not mentally incompetent or convicted of serious crimes are permitted to vote. In some states simple literacy requirements must also be met. Property qualifications, once widely prevalent, have almost entirely disappeared except in some local elections



Courtesy Brown Bros., N. Y.

ELECTION CAMPAIGN OF 1860

A torchlight procession passing through downtown New York

on the incurring of public debt. A number of Southern states, however, still require the payment of a poll tax as a prerequisite for voting.

The right to vote is usually established by a process of "registration." Those who wish to vote generally have to appear personally before a board of election officers and get their names entered in a registration list after proving their right to do so. In some places there is non-personal registration, with the election officers drawing up the lists of eligible voters on their own responsibility, but with facilities for any eligible voter to make sure he is included. Registration is sometimes required annually, but a large part of the nation now has "permanent registration," under which a voter once registered stays registered as long as he continues to live in the same place and to vote with a prescribed degree of frequency.

The candidates for elections are secured in various ways. Sometimes they are selected by primaries, sometimes by conventions, and sometimes by petition. When partisan primaries are used to select party candidates, other candidates can usually be put on the final ballot by petition. Candidates for primaries of any kind are usually designated by petition. See also *Primary Election*.

Elections may be "direct" or "indirect." An indirect election is one in which the final selection is made not by the original voters but by a group of people elected by them. A notable example is the election of the President and the Vice-President of the U.S. In this election the people of

each state elect a block of Presidential electors and the successful electors cast their votes for the Presidential candidates to whom they have pledged themselves in advance (see also *Electoral College*). In some other countries one house of the national legislative body is elected wholly or in part indirectly, by members of local assemblies or other elected bodies. For a discussion of election methods, see *Vote*. See also *Poll Tax*.

Elective Courses (*ē-lĕk'tiv kōrs'ez*), the term applied in American schools and colleges to the courses of study that may be chosen by undergraduate students. Formerly all students were required to pursue certain courses of study, but this plan was supplanted by the elective system in most institutions of higher learning. At present only a few institutions adhere rigidly to a required curriculum, and students are privileged to select some of their studies in accord with their inclinations. Within recent years, however, a swing away from the elective system has appeared. Harvard Univ., a leader in the movement toward establishing elective studies and elective courses, recently embarked on a plan under which every student takes certain compulsory courses. Yale and Columbia Univs. followed its lead. At present nearly all of the state universities offer elective courses; and most of the institutions where a full elective system does not exist permit some choice in the selection of particular studies.

Elector (*ē-lĕk'tēr*), or PRINCE ELECTOR, the title of those princes who had the privilege of elect-

ing the emperor of Germany. This title was established in 1256, when there were seven electors, those of Saxony, Cologne, Bohemia, Mentz, Treves, Brandenburg, and the Palatine. Later the electoral honor was transferred from Palatine to Bavaria, but it was restored to the former in 1648, thus making eight electors. In 1692 the number was increased to 10, but the office became obsolete on the dissolution of the Holy Roman Empire in 1806. See also *Electoral College*.

Electoral College (*ê-lêk'îêr-âl kôl'ij*), the body of men chosen by the people of the several states to elect the President and Vice President of the U.S. The college is constituted of the entire body of electors chosen. Each state is entitled to select a number of electors equal to the whole number of members sent to both houses of Congress. Any person holding the office of Senator, Representative, or other position of trust or profit under the U.S. cannot serve as an elector. The first Tuesday after the first Monday in November is the day fixed by law of Congress for choosing electors. The electors of each state meet in the respective state capitals on the first Monday after the second Wednesday in December next after they are chosen for the purpose of casting their ballots for President and Vice President.

No discussion of the merits of the candidates takes place, the electors voting for the particular persons previously placed in nomination by conventions called for that purpose. This is a perversion of the intention of the authors of the Constitution, since electors were intended to cast their votes according to their own judgment. In casting the ballots, electors are required to vote for candidates, one of whom, at least, shall not be an inhabitant of the same state with themselves. Lists of persons voted for at each capital are made, signed, and certified by the electors and transmitted to the seat of government of the U.S., each list being directed to the president of the Senate. By law of Congress three certificates of all the votes given are carefully prepared, of which one is delivered in person to the president of the Senate at the seat of government, a second is sent to him by mail, and a third is delivered to the judge of the district court in the district in which the electors assembled to vote.

At a joint meeting of both houses of Congress held on the sixth day of January following the reception of the certificates, the reports are opened by the president of the Senate and canvassed in the presence of both houses. The persons having the greatest number of votes for President and Vice President are declared elected, but, if no candidate has a majority, the members of the House of Representatives choose the President by ballot from the three who received the greatest number of votes in the electoral college, each state being entitled to one vote, while the Senate

chooses the Vice President in a similar manner. John Q. Adams was elected President by the House of Representatives in 1828, and R.M. Johnson Vice President by the Senate in 1837.

Electoral Commission, a commission appointed by an act of Congress, Jan. 29, 1877, to investigate certain alleged frauds regarding the electoral votes of Oregon, Florida, Louisiana, and South Carolina in the Presidential election of 1876. See *United States: NATIONAL POLITICS*.

Electrical Code (*ê-lêk'îrîk-âl kôd*), NATIONAL, rules and regulations covering the installation of electrical equipment from the standpoint of safety from accident and fire. The dangers of death and fire from electricity not properly controlled were realized in the early days of the industry, and in 1893 steps were taken to formulate rules for the design and installation of electrical equipment for power and lighting purposes. The National Electrical Code was originally drawn in 1897 as the result of united efforts by various insurance, electrical, architectural, and allied interests. Since that date it has become the standard for the entire nation. To keep pace with new discoveries and equipment and to remedy faults not anticipated, the code is revised every few years.

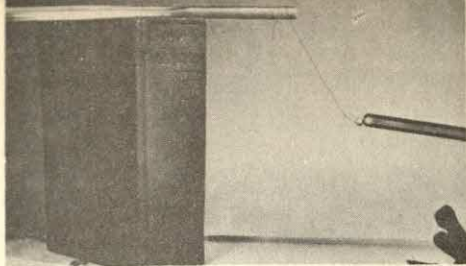
Electrical Units (*ê-lêk'îrîk-âl ū'nîts*), three units or quantities commonly used in electrical engineering: the unit of current, called the *ampere*; the unit of potential, called the *volt*; and the unit of resistance, called the *ohm*. These quantities are related to each other by Ohm's law, which states that the electric current in a circuit varies directly as the electromotive force and inversely as the resistance when the current is unvarying and the temperature is constant. Units were chosen for two of the three quantities and in this way the third one was determined. The two chosen were current and voltage. An *ampere* is the force of an electric current with an intensity of one volt flowing through a resistance

of one ohm. Resistance = $\frac{\text{voltage}}{\text{current}}$. Voltage $\times$

current $\times$ time is mechanical work expressed in ergs or joules.

For some purposes it is necessary to subdivide these quantities; thus, in telegraphy the practical unit is the *milliampere*, i.e., 1/1000th of an ampere. For others, it is necessary to use multiples; thus, insulation resistances are described in terms of the *megohm*, i.e., 1,000,000 ohms. The following multiples are commonly used: 1 megohm = 1,000,000 ohms; 1 microhm = 1/1,000,000th of an ohm; 1 kilowatt = 1,000 watts; 1 microampere = 1/1,000,000th of an ampere.

Electric Field (*ê-lêk'îrîk fîld*), a term applying to a region under the influence of some physical agency (such as electricity, magnetism, or a



Courtesy Science Service, Wash., D. C.

ELECTRIFIED ROD

An electrified rod of ebonite attracts a pith ball (*left*); after touching the rod the pith ball is repelled (*right*)

combination), produced by an electrically charged object, by electrons in motion, or by a magnet.

Electric Fish (*ē-lēk'trīk fish*), the popular name for any fish that has the power of giving sensible shocks of electricity when touched. About 50 species of marine animals can do this. A fresh-water eel of South America is the most powerful of these animals in this respect. The body is from 5 to 8 ft. long, blackish in color, and about the same thickness throughout. Little is known about its generation of electricity, but it is certain that this force is used in killing other fish for food. The electric organs are intimately connected with the nervous system. The torpedo, a member of the ray family, is an electric fish found off the Atlantic coast of North America. A catfish common to the Nile, known as the raash, is about 4 ft. long, and gives an electric shock about equal to that of a Leyden jar (*q.v.*).

Electric Generator. See *Dynamo; Generator.*

Electric Heating, the conversion of electricity into heat. The law of electric heating, known as Joule's law, was formulated in 1841 by James Prescott Joule (1818-89), of Manchester, England. Joule's law states that the rate of heating in any conductor of electricity depends upon the square of the current (the current multiplied by itself) passing through the conductor multiplied by the conductor resistance. Expressed mathematically, $I^2 \times R$; I = the current in amperes and R is the resistance in ohms.

Extremely high temperatures can be produced for industrial purposes by various types of electric furnace (see *Furnace*). Room heating by electricity is provided by local heaters rather than central furnaces. The most familiar type of electric heater consists of groups of small resistance wires or ribbons mounted on an insulated frame within a protective enclosure. An electric current passed through the resistance wires causes them to heat. This localized heat may then be distributed through the room by a small fan which forces air through the heated coils.

Radiant heating, a comparatively new development, is accomplished by embedding resistance wires in nonconducting and nonflammable panels of a wall, floor, or ceiling. In this way, the entire panel is heated and the heat is distributed with extraordinary evenness and economy throughout the room.

In cold climates electric heating is used principally as an auxiliary method. In the more temperate climates, especially where electricity is cheap (one cent or less per kilowatt hour), it is practical to heat entire homes electrically. In the U.S., low-cost electricity, produced by water power, is available in the Tennessee Valley and in the Pacific Northwest; in those areas electric heating has made considerable progress.

Electricity (*ē-lēk-trī's-i-tē*), a form of energy which is associated with the presence of invisible particles called electrons and protons. Both static and dynamic electricity involve these same invisible particles, which are the fundamental constituents of all matter. Thales of Miletus (640-546 B.C.) is credited with the discovery that amber when rubbed acquired the property of attracting light bodies. The word electricity comes from the Greek word for amber, *elektron*.

GENERAL CONCEPTS. The earliest method of producing static electricity was by rubbing two dissimilar materials together. In this process it can be shown that the two materials rubbed together merely interchange charge, so that each is given a charge equal in amount to that produced upon the other body but of opposite kind. When an ebonite rod is rubbed with fur the kind of charge accumulating upon the ebonite is called negative, while that accumulating upon the fur is called positive. Although it is not quite so easy to demonstrate, it is possible to charge electrical conductors by friction as well as nonconductors.

The phenomena of static electricity have dwindled in relative importance with respect to those of current electricity with passage of time. New and significant applications of current electricity occur continuously. Three fundamental aspects of the electric current are recognized: magnetic, thermal, and chemical. Each of these aspects has important applications in the production or use of electricity.

The terms conductor and nonconductor are used for grouping materials according to their ability to carry electricity. The distinction is not definite, since there exists a large class of materials known as semiconductors, which permit passage of electricity, although not so readily as do carbon and the metals.

ELECTROSTATICS. The attraction of light objects, such as pieces of paper or cloth, may be taken

to indicate the presence of an electric charge upon an attracting body. However, for the identification of the kind of electric charge a pith ball hung by a silk thread from a glass rod such as shown in *Figure 1* may be used. When the pith ball is approached by an electrified rod of ebonite, it is attracted at first and swings into contact with the rod, but later it is repelled. The action is the result of the transfer of a small amount of the charge from the rod to the pith ball at the instant of contact. Now, if an unknown charge be brought into the vicinity of the pith ball, the latter will be repelled by a charge of the same kind and will be attracted by a charge of the opposite kind.

Electrostatic induction may result in the production of charges by separation upon a body initially uncharged. *Figure 2* shows a charged sphere *C* in the vicinity of a metal cylinder *AB*.

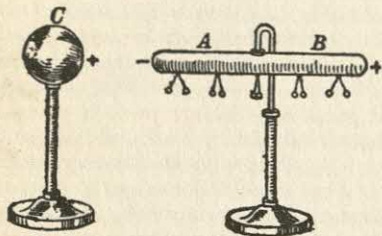


Figure 2
ELECTROSTATIC INDUCTION

Electrostatic induction produced by a charged sphere upon an insulated cylinder

The charge upon the sphere attracts a charge of opposite kind to the near end of the cylinder and leaves a charge of the same kind upon the far end of the cylinder. These charges produced by induction may be recognized from the divergences of the pith balls hanging from the cylinder. It will be observed that the induced charges are concentrated near the ends of the cylinder and that the pith balls near the center of the cylinder are not affected. By removing the inducing charge the induced charges may be caused to coalesce and the pith balls will collapse, showing that the induced charge is not permanent.

ELECTRIC CURRENTS. The production of a sustained current of electricity is accomplished by any one of several means. The earliest known method was by converting the chemical energy of an electric cell into electrical energy. Cells for causing this effect are known as either galvanic cells or voltaic cells. A number of these cells may be connected in suitable arrangements for increasing the current or prolonging the life of the cells. A number of practical cells with desirable characteristics have been developed. The two cells most commonly used at the present time are the LeClanché or dry cell and the copper-oxide

caustic soda cell.

Dynamos (*q.v.*) called generators (*q.v.*), using rotating coils in intense magnetic fields, are used to produce large amounts of electrical power. The machines require mechanical energy for rotating the coils, which may be obtained from water power or by burning coal, oil, or gas. A number of ways of converting other forms of energy into electrical energy are known. While these usually involve small amounts of power, they are of importance in special applications. A type of photoelectric cell, called the photovoltaic cell, will convert light energy directly into electrical energy. The thermocouple, discovered by Thomas J. Seebeck (1770-1831), converts thermal energy directly into electrical energy.

ELECTRICAL UNITS. The practical unit of electric charge is called the coulomb after Charles Augustin de Coulomb (*q.v.*), the discoverer of the law of interaction between electrical charges. When a current of one ampere flows in an electric circuit for a time of one second, the amount of electricity circulated is equal to one coulomb. This quantity of electricity will release in a silver electrolytic cell approximately 0.001118 grams of silver.

The pressure causing the passage of an electric current in a conductor is termed the potential difference or voltage. A high voltage corresponds to a high pressure and causes the passage of a large current in a conductor. The volt used as the unit of potential difference derives its name from Alessandro Volta (*q.v.*). It corresponds very nearly to the potential difference at the terminals of the unsaturated Weston cell (an electric cell used as a standard), which more exactly has a terminal voltage of 1.018 volts. A law discovered by George Simon Ohm (1789-1854) states that for metallic conductors the ratio of potential difference to current is a constant called the resistance of the conductor. The unit of resistance is called the ohm; it is approximately equal to the resistance of 1,000 ft. of copper wire which is 0.1 in. in diameter.

The power produced or consumed by electrical apparatus (with the exception of electric motors) is expressed in watts or in kilowatts. The latter quantity is equal to 1,000 watts and is used when large amounts of power are involved. In the case of direct-current apparatus the power consumption in watts is equal to the product of the potential difference across the apparatus expressed in volts and the current through the apparatus expressed in amperes. For alternating-current apparatus an additional factor is necessary, which is termed the power factor. This quantity depends upon the apparatus and varies from 0 to 1 for different pieces of apparatus.

The various electrical units are easily related, with the result that any one of the quantities may

be computed from two of the others. The relationships may be expressed in the form of equations as follows:

Quantity	Symbol	Relation
Coulomb	Q	ampere $\times$ second
Ampere	I	coulomb/second
Volt	V	ampere $\times$ ohm
Ohm	R	volt $\div$ ampere
Watt	W	ampere $\times$ volt

DISTRIBUTION OF ELECTRICITY. Approximately two-thirds of the electricity generated in the U.S. is produced by steam generating plants burning coal. The flow chart on the following pages shows the steps in converting the energy of coal into electrical energy. The coal from the mines is transported by railroad or barge to steam generating plants. Huge scoop shovels unload the coal and supply it to the boilers in which the steam is produced. Turbine generators utilize the steam to generate electricity at high potential, which is transformed (see *Transformer*) to a higher potential difference for transmission over a power network to industrial and residential users. The potential difference to which the electricity is transformed varies from 13,000 volts to 230,000 volts, depending upon the distance over which the power is to be transmitted. In the chart the potential difference across the network is 66,000 volts.

Transformer substations convert the high-potential electricity to lower potentials for distribution to users. Low-voltage (*q.v.*) distribution lines supply the individual homes in a community. The transformer makes it possible to convert electricity to the potential most desirable for the user and electricity may be transformed any number of times. For homes and small stores the electricity is usually supplied at a potential of 115 or 230 volts while for commercial users the electricity is supplied at potentials up to 4,000 volts. For operation of electric streetcars a rotary converter or rectifier is used which changes the alternating current into direct current. Street lamps are frequently operated in series and utilize potentials as high as 10,000 volts.

About one-third of the electricity generated in the U.S. is produced by using water power. In water-power plants turbines utilize flowing water to rotate generators. The electricity generated is transmitted and distributed in the same way as that from steam generating plants.

APPLICATIONS OF ELECTRICITY. Commercially generated electrical currents are invariably produced by electric generators. Two kinds of current are produced: a direct current, which has constant magnitude and direction, and an alternating current, which fluctuates in amount and direction a fixed number of times every second. Both kinds of current may be used for most pur-

poses. Electric lamps, motors, and radios are customarily operated on alternating current, although they may also be operated on direct currents. For certain purposes direct currents are necessary, a notable example being electric traction.

Electricity is used in the household for lighting, heating, refrigeration, water pumping, cleaning, operating radios, and countless other purposes. Except for isolated farms the electrical power for the household is generated at central generating stations from which it is transmitted over power lines or through underground cables to individual homes, offices, stores, and factories. The power consumed by each household is measured by a meter installed on the premises.

In industry, electricity is called upon to perform a wide variety of operations. Electric motors (*q.v.*) supply the power to operate machinery of every description. Electroplating (*q.v.*) and the separation of metals from ores, frequently require large amounts of electrical energy. Electric welding (see *Welding*) and brazing are frequently employed in the fabrication of metal parts and structures. High-quality steels are produced in the electric furnace (see *Furnace*). Electric lamps supplying large amounts of infra-red radiation produce rapid drying of paints and varnishes.

The telephone, telegraph, and radio are all electrical devices which make communication easier and faster. In many cases the amount of electrical power utilized is very small, but the application of vacuum-tube amplifiers makes it possible to restore the feeble currents at the receiving station to satisfactory level. Television, radar, and loran (*qq.v.*) all depend upon electricity for their operation. Facsimile transmission of pictures and charts is accomplished by wire and radio utilizing feeble electrical currents. Automatic warning signals employing electric circuits protect many stores, offices, and banks against hazards such as fire or burglary. Block signals (*q.v.*) control the operations of railway and subway trains in crowded areas.

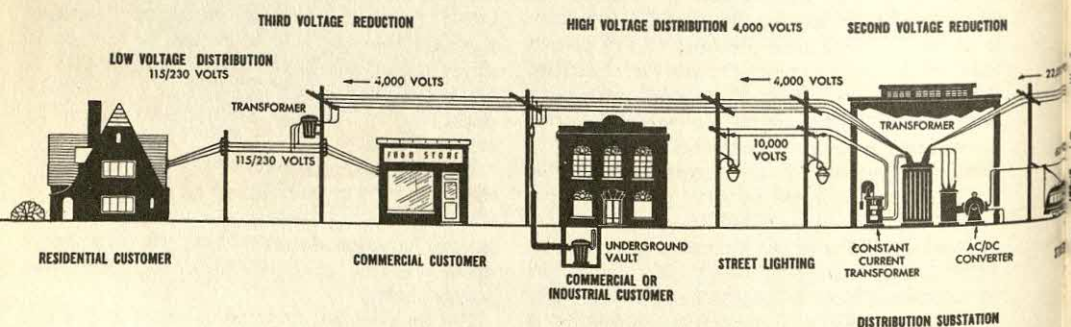
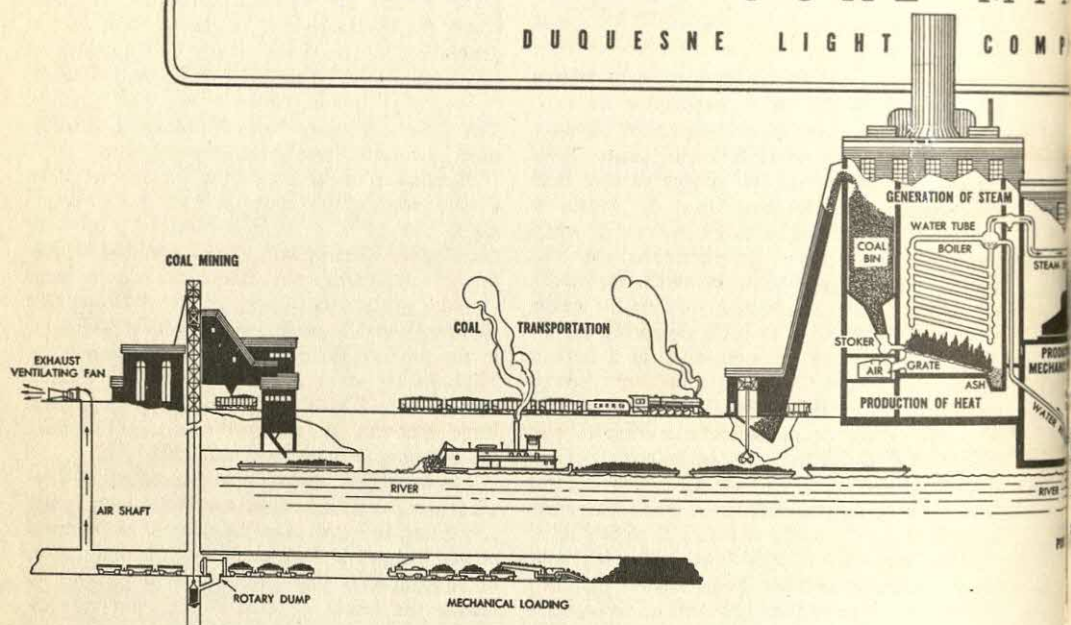
Electrical transportation is supplied on land by the street railway and electric railway (*qq.v.*; see also *Trolley Car*). Some trucks are operated from storage batteries. At sea turbine-generator drives operate ferries, tugs, warships, and many passenger vessels.

For the scientist, electrical devices are very useful. X-rays (*q.v.*) produced electrically are used to study the structure of opaque materials. An electron microscope produces magnifications very much larger than those obtainable with ordinary microscopes (*q.v.*).

HISTORY. After the discovery of the electrical attraction by amber by the Greek philosopher, Thales, no worth-while progress was made in electrical theory or application until the 16th century. At this time William Gilbert (1544-1603),

ELECTRIC FROM THE COAL MINE

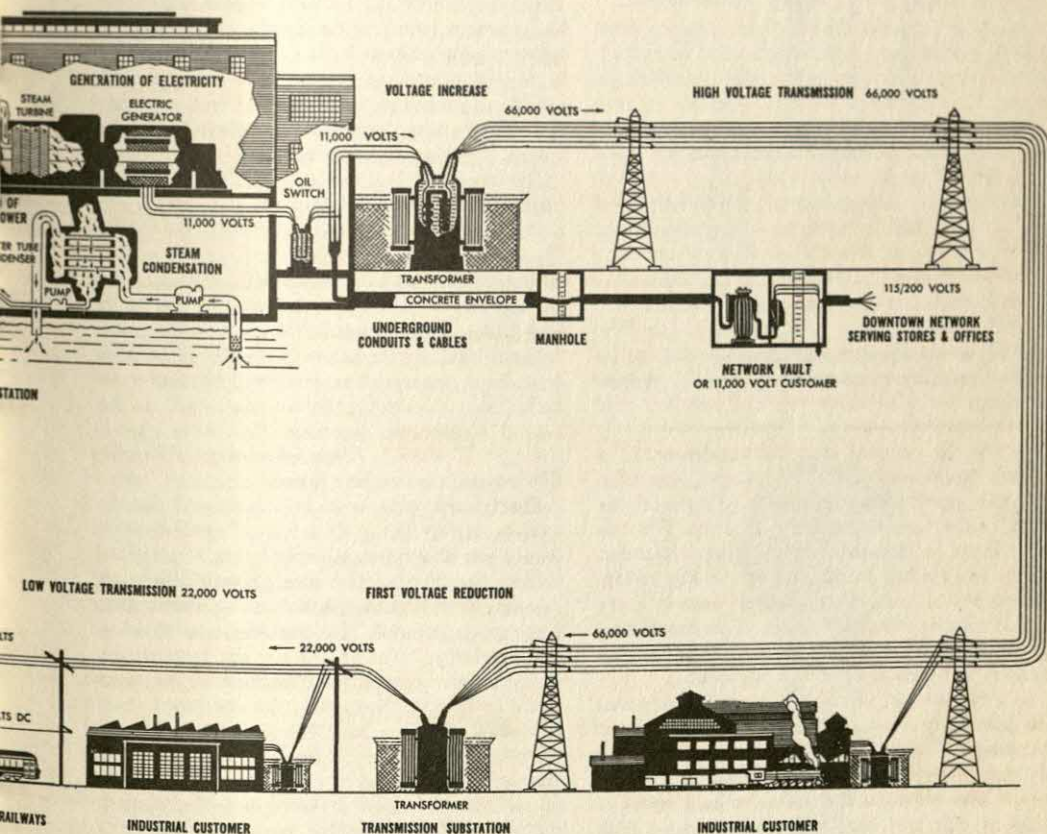
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TRANSMISSION AND DISTRIBUTION OF ELECTRICITY

physician to Queen Elizabeth, made some valuable experiments on magnetism. Otto von Guericke (1602-86), of Germany, invented the first electric machine (*q.v.*) about 1675. The Dutch writer Musschenbroek is said to have invented (1746) the Leyden jar (*q.v.*) shown in Figure 3 and first exhibited it at Leyden, Holland.

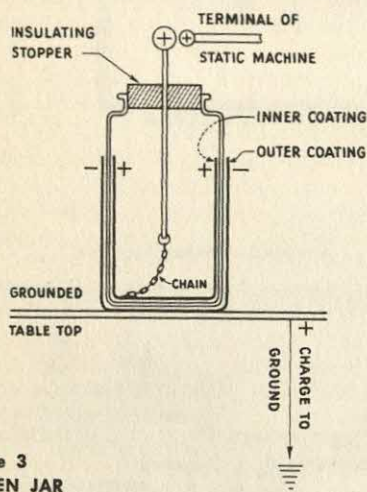


Figure 3
LEYDEN JAR

Used to store electrical charge, coatings of tin foil on the inner and outer surfaces of the Leyden jar hold the charge

This was the original electrical condenser. In a famous experiment performed in 1752, Benjamin Franklin proved that lightning (*q.v.*) and the spark of the Leyden jar were the same. For this experiment he elevated a kite during a thunderstorm, tying a key to the end of the kite string. The sparks he drew from the key were in every way similar to electrical sparks. The experiment was very dangerous and a number of experimenters lost their lives trying to repeat it.

In 1780, Aloisio Galvani (1737-98) discovered the possibility of producing current electricity. Alessandro Volta showed soon afterward that current electricity could be produced by chemical means and invented the voltaic pile, a series of disks of zinc and copper having pieces of cloth moistened with dilute acid between each pair of disks. An English scientist, William Nicholson (1753-1815), used the voltaic pile to electrolyze water. Hans Christian Oersted (1777-1851), of Denmark, made discoveries in 1820 by which electricity and magnetism began to be studied as allied phenomena. In 1876, Henry A. Rowland showed that a rotating electric charge was capable of affecting a magnetic needle and so established the experimental connection between static electricity and electric currents.

The identification of the electron as the fundamental unit of negative electricity was accom-

plished by Sir Joseph J. Thomson (1856-1940). In 1913 Robert A. Millikan, of California, determined the charge upon the electron and showed that it would take a number of electrons equal to 625 followed by 17 zeros to equal one coulomb of electricity. The positive counterpart of the electron, named the positron, was found in 1930. It does not exist in equilibrium outside the nucleus of atoms and was much more difficult to find than the negative electron. The proton, which is the ion of the hydrogen atom, was also discovered by J.J. Thomson.

An instrument called a cyclotron, commonly called an "atom smasher," was invented by Ernest O. Lawrence (*q.v.*), of California, to impart high speed to protons in order that they might be used in atomic transmutations. An electrical apparatus capable of imparting high speed to both electrons and protons was developed by Robert J. Van de Graaff. See also *Atom*; *Betatron*.

The theoretical aspect of electricity has been treated competently by Michael Faraday (1791-1867) and James Clerk Maxwell (1831-79). Charles P. Steinmetz (1856-1923) made important contributions to electrical theory and to the application of electricity. Among the inventors who have made discoveries of great value in the field of electricity are Samuel F.B. Morse, Thomas A. Edison, George Simon Ohm, Alexander G. Bell, Nikola Tesla, Guglielmo Marconi, Lee DeForest, Vladimir K. Zworykin. See *Atom*; *Atomic Energy*; *Dynamo*; *Electrochemistry*; *Electron*; *Electronics*; *Galvanism*; *X-rays*.

Electricity, DOMESTIC. It is estimated that an average family living in a fully electrified home would use about 650 kilowatt-hours of electrical energy per month. This energy would provide, in addition to lighting, for cleaning, ironing, refrigeration, laundry, dish-washing, and cooking.

Electricity, MEDICAL USE OF, the employment of electrically operated instruments in the treatment of disease. Numerous devices based upon electrical principles may be of assistance to the physician. One of the most valuable of these is the electrocardiograph, shown in the figure, a type of oscilloscope which makes it possible to study the action of the heart by currents picked up at electrodes attached to the wrist, etc., of the patient. For the surgeon the electric knife spraying a high-frequency alternating current into the tissue as it is cut reduces the amount of bleeding and tends to reduce infection. It is especially useful in delicate brain operations. Radiotherapy offers the physician a means of producing an artificial fever within the body of his patient which is completely at his control. By this means, high-frequency electrical currents supply heat to the body in the same way that they supply energy for transmission of radio waves. In diathermy high and short fre-

quency currents are employed to relieve pain, as in the case of rheumatism or stiffness of parts of the body due to colds, neuralgia, etc. With X-rays (*q.v.*) the physician is able to see into the body of his patient. High voltage X-rays are frequently used to replace radium in the treatment of tumors. Artificially radioactive materials produced by the cyclotron are used for the same purpose. An electroshock treatment is used in psychiatry (*q.v.*), and the mercury lamp, a source of ultraviolet radiation, is used in the treatment of skin diseases.

Electric Light (*é-lē'e-trīc līt*), the visible light obtained by the passage of an electric current through a mechanism suitable for converting the energy into light energy. Numerous devices have been invented for transforming the energy. The original electric light was the carbon arc which utilizes the production of heat produced at the gap between two carbon rods to cause the light. The electricity is conducted across the gap by ions of the volatilized carbon and an intense white light is produced at the crater formed in the positive electrode. The potential difference required to operate the arc light varies from 50 volts for the unenclosed arc to 80 volts for the enclosed arc. Frequently several arc lamps are operated in series for street lighting systems. An automatic mechanism shunts the current around any lamp failing to operate in order that the other lamps in the group will not be affected.

The incandescent lamp was the invention in 1880 of Thomas Alva Edison (1847-1931). In the original lamp shown in *Figure 1* a filament of carbonized bamboo was mounted in an evacuated glass bulb. The filament was heated to incandescence by the passage of an electric current. Later, when it became possible to draw tungsten into

fine wires, the tungsten filament replaced the carbon. This filament was more efficient than the carbon filament, since the tungsten could be heated to a higher temperature than the carbon. The tendency of the tungsten to evaporate and to produce gradual blackening of the glass bulb is avoided by filling the bulb with an inert gas such as nitrogen. The electrical power required per candlepower by gas-filled tungsten lamps is as low as 0.5 watts, while evacuated tungsten lamps require 1.5 watts and carbon-filament lamps require 3.5 watts.

Luminous-tube lighting is a recent development making possible high efficiency in the production of light electrically. Long tubes containing neon and other gases at pressures of 10 to 24 mm. of mercury are used for display. The light produced by the *neon lamp* is orange in color, while the *argon light* is blue and the *hydrogen light* is a brilliant red. These lights are operated from alternating current circuits through a step-up transformer at a potential difference of approximately 15,000 volts and a current of 15 to 50 milliamperes. The electricity is conducted through the tube by the gas ions and very little heat is produced in operation.

For industrial lighting and for photographic purposes the *mercury-vapor lamp* is used. This lamp contains mercury vapor at a low pressure.

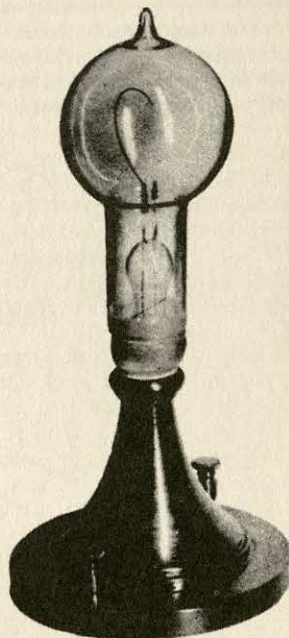
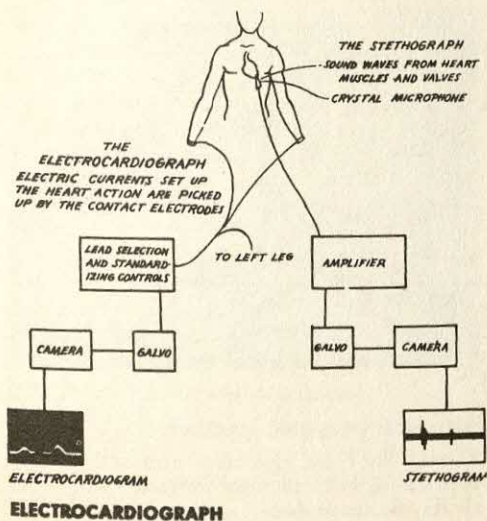
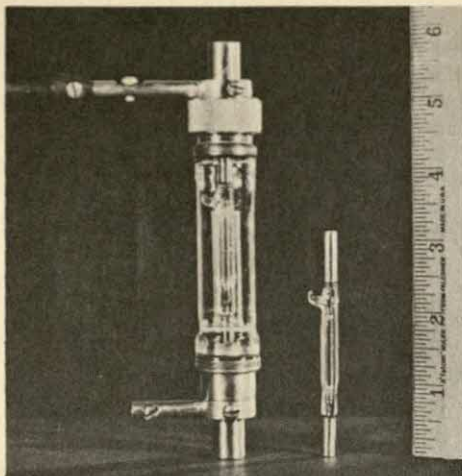


Figure 1
EARLY ELECTRIC LAMP

Thomas Edison's first commercially used electric lamp, showing a piece of the broken filament in the neck



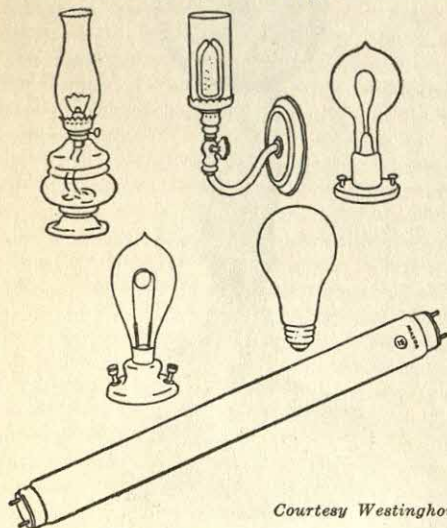
Courtesy General Electric Co., Schenectady, N. Y.

Figure 2
HIGH INTENSITY MERCURY-VAPOR LAMP

Cooling water is circulated through the jacket surrounding the inner tube

An electric discharge through the mercury vapor produces light of a blue color and great brilliance. Commercial mercury-vapor lamps include auxiliary apparatus for starting automatically and may be operated on either alternating or direct current. *Figure 2* shows a high intensity mercury-vapor lamp intended for producing brilliant illumination. The lamp is water cooled.

Fluorescent lamps produce a diffuse illumination suitable for stores, offices, and schoolrooms. The fluorescent lamp utilizes a glass tube having



Courtesy Westinghouse

MILESTONES IN ARTIFICIAL LIGHTING

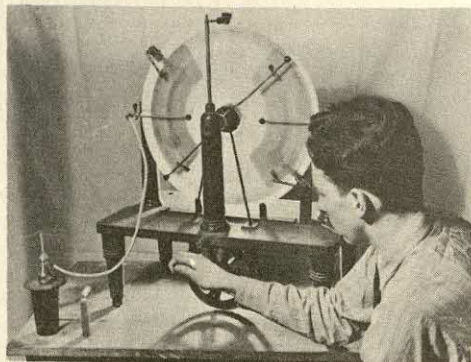
Kerosene lamp, gas mantle, first Edison lamp, tungsten-filament lamp, modern electric light bulb, and fluorescent tube lamp

ELECTRIC MACHINE

an inner surface coated with fluorescent salts. The electrical current passes through mercury vapor contained within the tube and produces ultra-violet light which is transformed by the fluorescent salts into visible light. Because the entire area of the tube is effective in light production, fluorescent lighting prevents glare and harsh shadows.

Technological improvement has produced increased usable life for various electric light sources as well as increased efficiency. The usable life of the tungsten filament incandescent lamp used for household illumination is considered to be 1,000 hours and of fluorescent lamps 2,000 hours. In general, the luminous efficiency measured in candlepower per watt increases as the usable life decreases. Tungsten filament incandescent lamps, known as *photoflood lamps*, are regularly used in photography as sources of brilliant white light. These lamps operate at much higher temperatures than ordinary lamps and have a usable life of only 2 to 5 hours.

Electric Machine (*ê-lê'e'trie mà-shēn'*), the name generally applied to any mechanism employed to convert mechanical energy into electrical energy. The earliest form of electric machine was devised by Otto von Guericke, of Germany, in the 17th century. In this machine a globe of sulphur was rotated on a spindle while being rubbed with the hands. The surface of the sulphur became electrically charged during the rotation and electric sparks were produced. Electric machines utilizing the phenomenon of electrostatic induction date from 1860, when C.F. Varley produced a form having six metal carriers mounted on a rotating glass disk. Among the better known of the induction machines are those of Toepler-Holtz and of Wimshurst. In these machines two glass disks are employed, having a number of



Courtesy Science Service, Wash., D. C.

TOEPLER-HOLTZ STATIC MACHINE

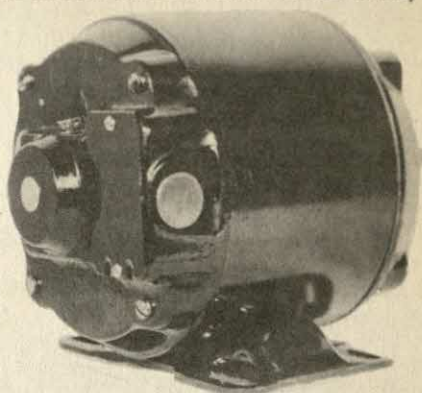
Turning the crank produces continuously an electrical charge which turns the electrical windmill and attracts the candle flame

pieces of metal-foil cemented on their opposite faces. As the disks are rotated past each other electrical charges of opposite sign are induced upon metal-foil and are transferred to collector combs attached to Leyden jars (*q.v.*) for storing the electric charge. A high potential difference is produced by these machines and electrical sparks several inches long may be observed. Such machines are unstable and produce only a small amount of power, so that they are useless for commercial purposes.

In 1929, Robert J. Van de Graaff designed a machine capable of producing potential differences of several million volts. This machine used a silk belt to charge a large copper sphere. The charge was sprayed onto the belt from a high-voltage transformer and rectifier apparatus.

Electric Meter (*mē'tēr*), a device for measuring or recording electrical quantities. The principal types of electrical meters are the galvanometer (*q.v.*), ammeter (*q.v.*), voltmeter (*q.v.*), wattmeter, and watt-hour meter. Most meters intended for use with direct currents are based upon a galvanometer having a moving coil and a fixed permanent magnet, invented by Jacques Arsène d'Arsonval in 1882. The passage of an electric

current through the coil of the galvanometer produces an interaction between the coil and magnetic field and causes the coil to rotate. A needle carried by the coil passes over a scale to indicate the current. The D'Arsonval movement may be



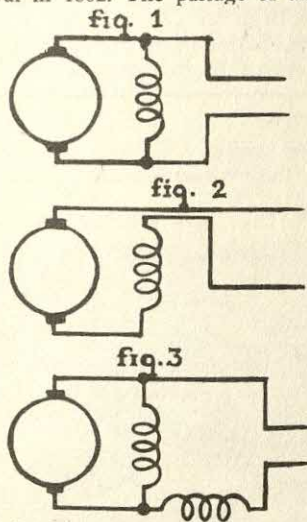
1/4 HORSE POWER DIRECT-CURRENT MOTOR

combined with external shunts or multipliers to convert the instrument into ammeter or voltmeter. In watt-meters and alternating current meters the permanent magnet is replaced by an electromagnet. The watt-hour meter used for measurement of domestic energy consumption utilizes an aluminum disk with a rate of rotation dependent upon power consumed. The aluminum disk is connected by gears to recording dials, which indicate the energy consumed.

Electric Motor (*mō'tēr*), a device used to convert electrical energy, through the medium of magnetism, into rotary mechanical energy. Motors vary in size from the small motors used for operating clocks up to those producing thousands of horsepower for driving battleships. The two principal types are the direct-current (D.C.) and the alternating-current (A.C.) motors, although there is a third type known as the "universal," which may be operated on either D.C. or A.C.

According to the relationship of their field and armature windings, D.C. motors are classified as shunt, series, or compound. These types are diagrammed in Figures 1, 2, and 3.

A.C. motors are classified as induction or synchronous. Induction motors, the most common, operate on the magnetic induction principle. A rotating magnetic field is set up in the stator (the stationary part of the motor). This revolving field induces an opposing magnetic field in the rotor (the rotating element of the motor), thus causing it to turn. Induction motors are further classified as "squirrel cage" or "wound rotor." These classifications refer to the method of constructing the rotor (the rotating element of the motor). The squirrel-cage type delivers a fairly constant speed,



ELECTRIC MOTORS

Figure 1. *Shunt Motor*. The armature and fields of the shunt motor are connected in parallel. The speed of the motor is practically constant regardless of load. This is the most common type of direct current motor

Figure 2. *Series Motor*. The armature and fields of the series motor are connected in series, making the speed of the motor increase as the load decreases

Figure 3. *Compound Motor*. The compound motor has a combination of series and shunt fields. This motor gives high starting torque and practically constant speed

while the wound rotor will operate at variable speeds. The synchronous motor derives its name from its speed characteristic, which is relatively the same as that of (*i.e.*, synchronous with) the generators producing the current which operates the motor. According to the electrical system upon which they are designed to operate, A.C. motors may also be classified as polyphase (two- or three-phase) and single phase. Single-phase motors are divided into split-phase, repulsion-induction, and capacitor, depending upon the method used in starting them. Both A.C. and D.C. motors are further classified as "constant speed" or "adjustable speed."

Small motors of any type, if rated at less than one horsepower in size, are called fractional h.p. motors. These motors are widely used for operating refrigerators, washing machines, oil burners, pumps, tools, and other domestic machines.

In the U.S. motors are highly standardized as to dimensions, h.p. ratings, and speeds.

Electric Railway (*rā'l'wā*), a means of rapid transit in which the cars are run by electric motors on current from an external power plant. Electricity is supplied to the cars through the track and on overhead trolley, or through a third rail running parallel to the tracks.

Electric railway development began over 100 years ago and reached its peak in the U.S. in the

early part of the 20th century, gradually giving way to the gasoline- or diesel-operated bus and the so-called trolley car (*q.v.*). In the early days of the industry storage batteries were used as a source of power for operating small passenger cars. The batteries were charged at a generating station or substation and were then used to run the car by means of an electric motor on the car axle.

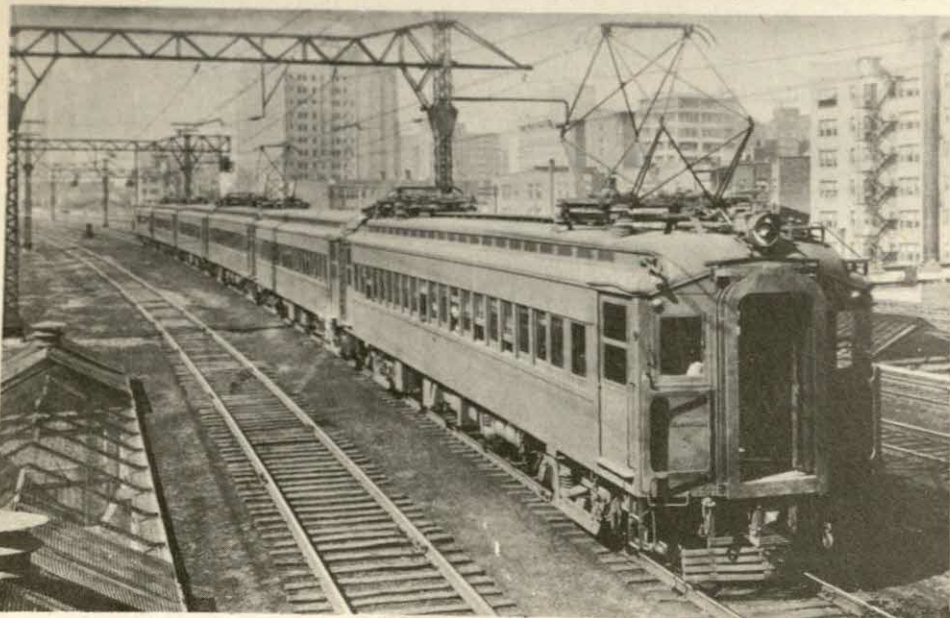
Electrified steam railway operation actually began in this country on the 7-m. Nantasket branch of the New York, New Haven & Hartford R.R. on June 30, 1895. This was followed on Aug. 4, 1895, by the first electric operation of main-line track, through the four-mile Baltimore tunnel of the Baltimore & Ohio R.R. The first large-scale electrification in this country, however, was that of the Long Island R.R. Work on this project was begun in 1904, and the first train operation was in 1905.

The railroads of the U.S. consume annually about 1,641,000,000 kilowatt hours of electrical energy for electric railway operations. Five hundred electrically propelled locomotives and more than 2,500 motor and trailer cars are operated over 5,100 miles of track. This mileage includes tracks electrified for (1) commuter service near large cities, (2) through passenger and freight service between Eastern cities, as well as over

ELECTRIC LOCOMOTIVE, 1,000 H.P.

The trolley system over the tracks is a catenary distribution system composed of a messenger wire to support an auxiliary messenger wire and two grooved contact wires. These contact wires are normally held at 25 ft. above the top of the rail.

Courtesy Illinois Central System





Courtesy American Locomotive Co., N. Y.

DIESEL LOCOMOTIVE, 6,000 H.P.

mountain ranges in the Appalachian region and in the Northwest, and (3) short hauls through tunnels and in terminals.

Electrification sometimes permits economies of operation which justify the expense of the project, such as the attainment of higher accelerating speeds, elimination of the need for turning locomotives, greater utilization of equipment, increased terminal capacity, and elimination of the need for additional tracks.

Many of the railroad electrifications in the U.S. are of short length and were installed for special purposes, such as tunnel or terminal operation, and not solely for economy. Among the larger electrified installations notable for their extent and traffic characteristics (ranked according to mileage operated) are those of the Pennsylvania; Chicago, Milwaukee, St. Paul and Pacific; New York, New Haven and Hartford; New York Central; Long Island; Norfolk and Western; Reading; Erie-Lackawanna; and Illinois Central R.R.'s.

Several systems of electrification, using different methods of power distribution and various types of electric motive power, have evolved during the development of electric traction in this country and abroad. Today there are three basic systems of distribution suited to various types of locomotives:

- (1) The direct-current system, using an overhead catenary, generally distributing current at from 600 to 3,000 volts;
- (2) The single-phase alternating current sys-

tem, using an overhead catenary, generally distributing current at 11,000 volts, 25 cycles;

(3) The 600-volt third-rail system of distribution, used in some of the earlier installations and where overhead wiring is dangerous or impractical, as in subways and on long bridges.

The catenary on an electrified railroad is an overhead structure, consisting of longitudinal wires and cables, suspended from poles, which holds the electrically-charged trolley wire in firm position above the track. Electric current is transmitted from the wire to the locomotive motors by means of a pantograph. This consists of a collapsible, diamond-shaped frame attached to the roof of an electric locomotive or a motor car. It is operated by springs or compressed air and has a suitable current collector, or trolley-wire contact, at the top.

Electric locomotives are equipped with one or more traction motors which obtain their power from the overhead wire or from the third rail.

Large electric locomotives may have as many as four motors of 600 or more horsepower each. Some large electric passenger locomotives rate nearly 5,000 horsepower, while large electric freight locomotives frequently rate over 7,000 horsepower.

Electric locomotives are available for instant service if in good condition. They are able to accelerate or decelerate rapidly and can be operated forward or backward without having to be turned at the end of each run. Most electric locomotives have two control cabs for operation in

either direction. Each is equipped with headlight, warning bell, horn, automatic air brakes, sanding system, and other safety devices; and a steam generator for heating passenger trains.

On some railroads freight and passenger trains are pulled for a part of the distance by electric locomotives and for a part by diesel locomotives, the change being made at the limit of the electric zone. For suburban and local passenger traffic, when station stops are close together and high-speed service is required, motor car trains, known as multiple-unit trains, are usually employed instead of locomotives. These trains consist of operating units, each with its own traction motor and control equipment, operated from the head end of the train. An operating unit may be a single motor car and a nonmotorized or trailer car, but any number of these two-car units may be connected, and the entire train is operated by a motorman at the front end.

The use of self-generating diesel-electric locomotives—in short, diesel locomotives—and rail cars in American railway operations has been one of the outstanding developments of the past 20 years. An internal-combustion engine, burning fuel oil, operates generators which produce electricity. The electric current in turn drives the motors which propel the car or train. Many of the luxury streamliners in operation in the U.S. are drawn by one or more diesel locomotive units, sometimes totaling as high as 6,000 horsepower. Units of 5,400-horsepower capacity are used in heavy freight service on a number of railroads. The diesel locomotive is also used in switching service because of its instant availability for use. Diesel switch engines range from 150 to 1,800 horsepower. Diesel rail cars range in power from 150 to 900 horsepower.

See also *Motor Bus; Railroads; Street Railway; Subway; Trolley Car.*

Electrification (*ē-lēk-trī-fī-kā'shūn*), the generation and distribution of electricity. In 1960 (prelim.) the installed capacity of generating plants in the U.S. was 185,270,000 kilowatts. Nearly five-sixths of the total was represented by steam and internal-combustion generating plants and the balance by hydroelectric generating plants. In comparison the generating capacity in 1950 was 82,850,000 kilowatts. In 1960 (prelim.) the energy produced was 840,457,000,000 kilowatt hours (excluding Alaska and Hawaii), compared to 388,674,000,000 kilowatt hours in 1950 and 179,907,000,000 kilowatt hours in 1940.

Privately owned electric utilities produced 544,234,000,000 kilowatt hours of electricity in 1959, while publicly owned electric utilities produced 165,772,000,000 kilowatt hours.

In 1940, 2,050,000 farms in the U.S. out of a total of 6,097,000 were supplied with electricity. In 1950 the figure had risen to 4,424,000

out of a total of 5,382,000, and in 1960 to 4,526,000 out of 4,641,000. The U.S. government created the Rural Electrification Admin. (*q.v.*) in 1935 to extend electrical service to rural communities and farms by means of loans to finance power lines that would reach families not currently served. In 1949 the administration was authorized to make loans also for the installation and improvement of rural telephone service.

See also *Dam; Tennessee Valley Authority.*

Electrochemistry (*ē-lēk'trō-kēm'is-trī*), the branch of chemistry (*q.v.*) which treats of the chemical changes that are due to electrical energy, and investigates the chemical changes by which electricity is produced. That electricity causes chemical changes may be illustrated by placing two platinum rods in a strong solution of common salt, and then connecting them with a battery or a dynamo. The current will then decompose the solution and the sodium will be set free at the negative electrode, while caustic soda will be formed as the sodium combines with the water; and at the same time the chlorine will escape in bubbles through the liquid being set free at the positive electrode. That chemical action produces electricity is demonstrated by placing a zinc bar in a solution of zinc sulphate and a copper bar in a solution of copper sulphate, the solutions being separated by a porous partition, and as soon as the rods are connected by wire a current of electricity will pass through the circuit. Electrochemistry is employed in the manufacture of various chemical products, in extracting metals from their ores, and in electrotyping and electroplating (*qq.v.*). It enters into the manufacture of carbondum, chlorine, soda, and potassium chlorate. It is also vital in everyday life, in the form of the familiar dry cell and storage batteries. See *Accumulator; Galvanic Battery.*

Electroculture of Plants (*ē-lēk-trō-kū'l'tūr*), the method of stimulating the growth and development of plants by the use of electricity. Practical use has shown conclusively that electricity may be used as a stimulus in the form of electric light and by applying the current to the soil, the seed, and the plant. It has been demonstrated that seeds germinate more rapidly by applying electric stimuli before planting, requiring about half the time needed for seed untreated. Another method is to electrify a plot of ground by placing a system of wires in the soil, which are attached to a battery or electric machine at stated intervals. By either of these methods it is possible to increase the production of vegetables, especially peas, parsnips, tomatoes, beets, onions, and carrots. Both the arc and incandescent lights have a visible effect upon growing plants, in that they furnish beneficial rays and prevent injurious rays from passing through them. The flowering of Easter lilies has been hastened as much as 10

days and at the same time the colors have been improved, while the yield of lettuce has been increased considerably. The use of electricity in the culture of plants dates from experiments made in Massachusetts at the turn of this century. The Agricultural Experiment Stations of Cornell Univ. and of the Univ. of West Virginia are noteworthy for their contributions in this field.

Electrocution (*ê-lêk-trô-kû'shûn*), the method of inflicting capital punishment by passing a current of electricity through the body of the criminal. The victim placed in an "electric chair" receives the application of electricity which results in instantaneous and painless death. The first state to adopt this method was New York in 1888, since then followed first by Ohio, and then by others, including Alabama, Arkansas, Connecticut, District of Columbia, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Massachusetts, Mississippi, Nebraska, New Jersey, New Mexico, Oklahoma, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Vermont, and Virginia. Although at first opposed as being a cruel, unusual punishment, it is now looked upon as more humane than either hanging or decapitation, since death is instantaneous and presumably painless. A voltage of 2,200 (A.C.) is considered best, as it will cause instant death.

Electrode (*ê-lêk'trôd*), a terminal by which electricity is conveyed into and out of different media. The term is applied especially to the ends of the wires or conductors which lead from the source of electricity and terminate in the medium traversed by the current. Faraday introduced the terms *anode* and *cathode*, the former being the positive and the latter the negative electrode. The term is applied especially to the poles of the voltaic pile or battery.

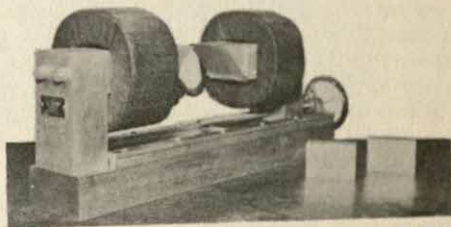
Electrolysis (*ê-lêk-trôl'i-sis*), the separation of chemical substances by the passage of an electric current through a solution called electrolyte. Electrolysis results in a deposition of ions at the electrodes of the cell through which the current is passed. The ions which bear negative charges are called *anions* and are deposited at the anode, while those bearing positive charges are called *cations* and are deposited at the cathode. The laws of electrolysis were discovered by the English physicist, Michael Faraday, in 1830.

1. The mass of a substance liberated in an electrolytic cell is proportional to the quantity of electricity passing in the cell.
2. The masses of different substances liberated by equal quantities of electricity are proportional to the chemical equivalents of the substances.

Kohlrausch (1879) and later on Arrhenius (1887) developed different theories concerning the velocity with which the ions move in opposite directions, and the conductivity of the electrolyte. Their theories explained the considerable

dissociation in salt solutions at ordinary concentrations. More recently Debye and Hückel (1924) advanced a theory in which the properties of electrolytes are clarified by taking into account the inter-ionic attraction principle of ionized solutes. The main idea underlying these calculations is that owing to electrical attractions an ion of a given sign will, on the average, be surrounded by more ions of the opposite sign than by ions of the same sign.

Electrolysis is the cause of much deterioration in metal structures and in pipes placed underground. Fine particles of metal will follow an electric current which leaves the metal structure or pipe and will pass into the damp earth. This process can be checked by reversing the direction of the current to make it flow toward the pipe or by completely stopping the flow of electricity. See also *Chemistry; Electrochemistry; Electroplating*.



Courtesy General Electric Co., Schenectady, N. Y.

ELECTROMAGNET

Coils of copper wire carrying electric current produce an intense magnetic field in the iron pole pieces. The separation of the pole pieces is adjusted by means of the hand wheel.

Electromagnetism (*ê-lêk'trô-măg'nê-tizm*), the phenomena involved in the interaction of an electric current with a magnetic field. The discovery that a magnetic field is produced by the flow of an electric current in a conductor was made by the Danish scientist, Hans Christian Oersted, in 1820. He found that the direction of the magnetic field around the conductor was tangential to a circle having the conductor as center and that the intensity of the field decreased as the distance from the conductor increased. Subsequent investigations showed that the magnetic field could be increased in intensity by winding the conductor into a coil having a large number of turns and providing the coil with a core of iron or some other magnetic material. The accompanying picture shows a large electromagnet with pole pieces of soft iron within the coils of wire.

The production of an induced electromotive force or current by cutting a magnetic field with an electric conductor was discovered by the distinguished English physicist, Michael Faraday, in 1831. Faraday showed that the direction of

the induced electromotive force reversed as the direction in which the conductor crossed the field reversed. Still a third effect relating the magnetic field and the electric current is the production of a force upon a conductor carrying a current in a magnetic field. The relationship between the electric current and the magnetic field was investigated quantitatively by the French scientist, André Marie Ampère (1775-1836). The unit of the electric current, the ampere, is named in honor of this experimenter. Ampère noted in his researches that two electric conductors carrying currents in directions parallel to each other were attracted, while the electric conductors were repelled when the currents flowed in opposite directions. This result is explained by the overlapping magnetic fields produced by the two currents.

Electrometer (*ê-lêk'trôm'ê-têr*), an instrument for measuring differences of electrostatic potential. Such instruments may also be used to measure the quantity of electricity indirectly by measuring the potential to which a conductor of known capacity is raised. Sir William Thomson (Lord Kelvin) is the inventor of the quadrant electrometer, which is the type in most common use. In this instrument a fan-shaped needle of paper is aluminized and suspended from a fine wire. The needle is suspended within four quadrant pieces of brass which are connected together in pairs and oppositely charged. When the needle is electrically charged, it experiences an attraction force from one pair of quadrants and a repulsion force from the other pair. The needle is rotated as a result of the unbalanced torque exerted upon it and the amount of rotation is determined by a telescope and scale. When the deflections are small it is found that the scale readings are very nearly proportional to the difference of potential. The electrostatic voltmeter is based upon the same mechanism as the electrometer and provides a very satisfactory instrument for measurement of high potential differences. No current is required for its operation.

Electromotive Force (*ê-lêk'trô-mô'tiv*), the electrical force which produces, or tends to produce, electric current. The words electromotive force are abbreviated for convenience to E.M.F. A voltaic cell, a thermocouple, or a generator are examples of an electric source having an electromotive force.

The electromotive force of an electric source is found to be equal to the difference of potential at the terminals of the source on open circuit. In any electric circuit the sum of all potential differences is equal to the electromotive force in the circuit. The instrument used for comparison of electromotive forces of various sources is called the *potentiometer*. The *volt*, which is the unit of electromotive force, was named after the Italian experimenter, Alessandro Volta (1745-

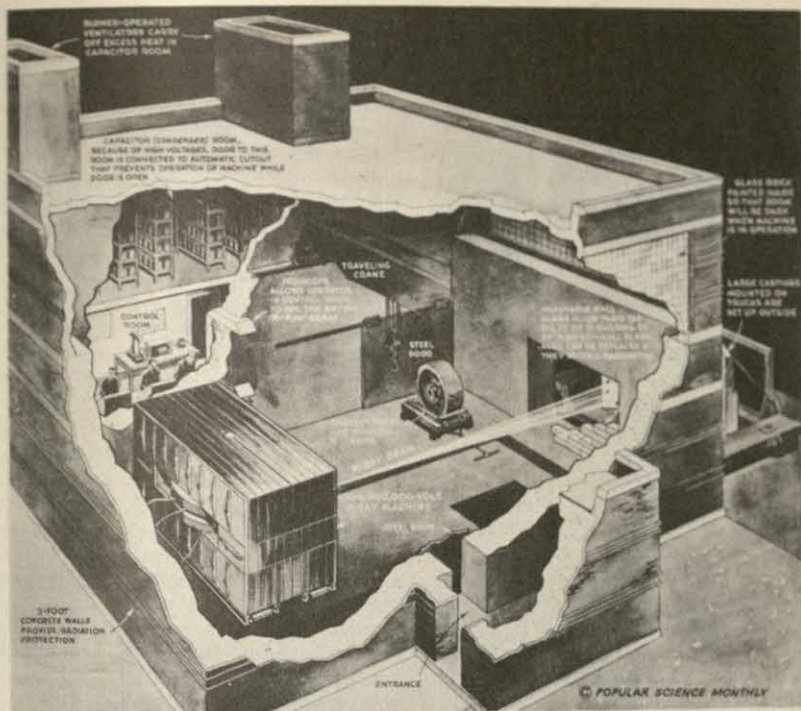
1827). The volt is equal to $1/1.01830$ part of the electromotive force of the Weston normal cell at a temperature of 20°C .

Electron (*ê-lêk'trôn*), a word designating the elementary electrical charge. In addition to having electrical charge the electron has a small amount of mass. When in motion the electron gives rise to the effect of the electric current and produces a magnetic field.

The electron is a constituent of all atoms. In the simplest atom, that of hydrogen, a single electron revolves around a positively charged nucleus. Since the mass of the nucleus is approximately 1,840 times that of the electron, the system resembles that of a planet revolving around the sun. Atoms of other substances have several electrons revolving around the nucleus, the exact number depending upon the kind of atom.

The identification of the electron was performed by J.J. Thomson in 1897. The name for the electron was suggested by the British physicist G. Johnston Stoney in 1891, after the name used by the ancient Greeks for amber. R.A. Millikan measured the charge of the electron in a famous experiment upon the drift of minute oil droplets. In 1930, the electron was shown to exist as a positive charge as well as the negative charge. To distinguish the two kinds of electrons they are termed *positrons* and *negatrons*. Bohr's theory and later on the theory of wave mechanics brought many new conceptions to the picture of an electron, its motion and general behavior. De Broglie, in 1924, attributed waves to the electron and other particles. He was able to compute the wave lengths to be expected for electron waves. Experiments by Davisson and Germer, using a beam of electrons which strikes the surface of a crystal at normal incidence, so that the electrons are reflected, or scattered in all directions, proved the computed and observed values of the electron wave lengths. Electrons, if given sufficient energy, are known to pass through thin films of matter. If an electron beam possesses wave properties, then in its passage through matter one should observe some or all of the phenomena characteristic of the passage of X-rays through matter.

A new idea was introduced by Uhlenbeck and Goudsmit when they assumed that the electron "spins" or rotates about an axis, and that it has both angular momentum and a magnetic momentum associated with this rotation. The angular momentum is constant in magnitude, but because of it the electron possesses two internal quantum states. The direction of its angular momentum depends on the quantum state of the electron. Dirac in 1928 showed that it was not necessary to attribute a spin to the electron, but he retained the idea of internal angular momentum with the associated magnetic mo-



Courtesy General Electric Co.

CUT-AWAY DRAWING OF A BUILDING REQUIRED FOR A 100,000,000-VOLT INDUCTION ELECTRON ACCELERATOR

ment. His theory brought wave mechanics into harmony with the theory of relativity. See *Atom; Electronics*.

Electronics (*ê-lêk-trôn'iks*), the branch of physics and electrical engineering which utilizes the flow of electrons through evacuated or gas-filled tubes to accomplish measurement and control. In rare instances spark gaps or arcs in air may be used advantageously. The fundamental features of an electronic tube are: the cathode which is the source of the electron current; the anode to which the electrons are drawn; and one or several control electrodes by means of which the flow of electrons is altered. Usually the electronic device is used with auxiliary electrical apparatus such as coils, relays, capacitances, and transformers.

The first electronic tube was devised by Sir William Crookes (*q.v.*) about 1870. This was a gas-discharge tube with a cold cathode. About 20 years later William K. Roentgen (*q.v.*) produced X-rays in a similar tube. Vacuum tubes having incandescent cathodes were applied to radio detection by Wehnelt and Fleming about 1904. An auxiliary grid for control of the electron flow was added to the vacuum electronic tube by Lee De Forest in 1907. This electronic tube has been fundamental to the operation of radio transmitters and receivers; it has likewise

been applied to long-distance telephone and telegraph communication. See also *Television*.

The photoelectric effect (*q.v.*) may likewise be utilized in electronic devices. Photocells are used extensively in industry for counting, sorting, and packaging. In the photocell, light falling upon the cell causes an electron flow. Wherever a beam of light may be used to accomplish control or measurement the photocell finds a place in industry and in research. Sound motion-picture reproduction requires use of the photocell.

An electronic device called the *thyatron* (*q.v.*) has had very great influence upon electronic control technique. The thyatron is a grid-controlled mercury arc. It has been applied extensively to industrial motor control at steel mills and to control electric welding. Other mercury-vapor arcs are utilized for industrial lighting, for rectification of alternating currents for electrolytic separation of metals, and for the production of ultra-violet light.

Discharge tubes in which ions rather than electrons conduct the current are numerous. A system of mass spectroscopy developed by F.W. Aston makes it possible to accomplish chemical and physical measurements upon minute amounts of matter. The cyclotron (*q.v.*) invented by E.O. Lawrence is used to accelerate ions of hydrogen to very high speed. In this apparatus the protons, or

ions of the hydrogen atom, are caused to travel in a spiral path in an intense magnetic field until the speed and energy of the protons become equal to the speed and energy which the protons would attain in traveling through a potential difference of 100,000,000 volts. An electrostatic generator developed by R.J. Van de Graaff is capable of accelerating both electrons and protons to high speed.

The cathode-ray oscillograph is an electronic tube which is applied to the purpose of measuring and analyzing periodic or transient phenomena. It is the basis of the television receiver and is the means by which the televised scene is traced upon a fluorescent screen. See also *Oscilloscope*.

Beginning in 1924 electronic devices were applied to many branches of industry other than radio and wire communication. The number of such applications is continually increasing. Among the present applications may be listed the following:

Rectification of a-c currents into d-c currents for electrolysis of metals, for operating street railways and electric railroads, for operating radio and X-ray equipment.

Conversion of a-c into d-c power for power transmission over long distances, and for inversion of d-c into a-c power.

High and low frequency industrial heating for welding, brazing, annealing, binding, curing, fusing, sintering, molding, etc.

Photoelectric color-matching.

X-ray radiography and fluoroscopy in industry and in therapeutics.

Application of ultra-violet radiation and grenz rays for germicidal action upon air and specific objects.

Electron microscopy of minute objects in which a beam of electrons controlled by magnetic fields produces an image. The magnifications obtainable by this technique far exceed those obtainable with visual light.

Fluorescent lamps and glow discharge or neon lights. See also *Radar*.

Electroplating (*ê-lêk'trô-plât'ing*), a useful application of electrolysis (*q.v.*). An electric current flowing from a positive pole (anode) to a negative (cathode) through an electrolyte—a solution of one of the salts of the same metal as the anode—will gradually cause metal from the anode to deposit itself on the cathode pole. Electroplating is used to give metal objects a protective finish against corrosion or to add a decorative finish such as nickel or silver, and for electrotyping (*q.v.*). Most metals may be electroplated; those most readily so treated are silver, gold, and chromium. It is also possible to deposit rubber in an electrolytic cell.

Electroshock (*ê-lêk'trô-shôk*), a therapeutic

treatment for certain nervous disorders, administered by passing an electric current, of relatively low voltage, through the patient's brain for a fraction of a second. See also *Electrocution*.

Electrostatic Induction (*ê-lêk'trô-stăt'ik*), the production of an electrical charge upon an uncharged body when an electrical charge is brought into its vicinity. In electrostatic induction there is no actual contact between the inducing charge and the uncharged body. The effect may result in a temporary separation of charges which recombine when the inducing charge is removed. However, if the body be connected momentarily to the earth while the inducing charge is in its vicinity, a permanent electrification will be produced upon the body. The effect may be explained by assuming that the inducing charge attracts unlike charges and repels charges of a like kind. See also *Induction* (in electricity).

Electrotyping (*ê-lêk'trô-tîp'ing*), the process of producing metal copies of original engraved plates, printing type, woodcuts, halftones, etc., by means of the electro-deposition of copper upon a mold taken from the original. The molding case consists of a thin plate of lead or copper with a coating of wax about 1/8 in. thick. Mold and original form are warmed and dusted with black lead (graphite) and lampblack so that they may be easily separated from each other. They are then placed in the molding press, which presses the mold and the original together so that the mold bears the pattern of the original. The mold is removed and "built up" by the operator to insure a perfect surface without excess wax. Since wax is a nonconductor of electricity, a film of graphite mixed with water is sprayed over it to make it electrically conductive. It is now ready for the electrolytic bath, which consists of water containing copper sulfate and sulfuric acid, in which are suspended two electrodes. The cathode electrode is connected with the negative pole of a dynamo. The anode or positive electrode consists of bars or plates of copper attached to the positive terminal of the dynamo. The mold is placed in the tank and attached to the cathode. When the current from the dynamo is turned on, the copper anodes are dissolved and move across to the cathode and are there deposited. Since the wax mold is serving as the cathode, it is gradually plated with copper. It requires from two to eight hours for the mold to receive a thin coat of copper. The mold is then removed and the shell of copper is separated by heat from the wax. The back of the copper shell is painted with soldering fluid and coated with solder sheets. It is then backed with molten electrotpe metal. After finishing operations to insure perfection of the plate, it is either beveled for use on a patent printing base, or mounted type-high on a wood block, if it is to be printed as a mounted plate.

ELEGY

"Steel electrotypes" are electrotypes made by substituting nickel bars for the copper anodes in the electrolytic bath, and, of course, substituting nickel sulfate for copper sulfate in the solution.

Lead mold electrotypes have sheet lead substituted for wax in the preparation of the mold.

Electrotyping is a chemical process, similar to electroplating (*q.v.*). Solutions of acids, bases, and salts in water possess the property of conducting electric current. These compounds are decomposed into their elements. These elements possess electrical charges. The cations, which are the positively charged atoms, proceed to the negative electrode. The anions, or negatively charged atoms, proceed to the positive electrode. Thus a soluble, positive electrode will gradually be deposited on the negative electrode. The weight of metal deposited is in proportion to the total quantity of electricity which passes through the solution. See also *Chemistry; Electrochemistry*.

Elegy (*ēl'ē-jī*), a poem written in an earnest, melancholy style. The ancient Greeks and Romans applied the term to the martial lyrics and the erotic poems, and sometimes extended its use to describe the lessons of practical wisdom by such writers as Solon. Catullus was the first great elegiac writer of the Romans, and after him came Propertius, Tibullus, and Ovid. Modern literature contains many fine lyrics, such as Tennyson's "In Memoriam," Milton's "Lycidas," and Gray's "Elegy Written in a Country Churchyard."

Elements (*ēl'ē-mēnts*), the constituent principles of anything which has not been resolved into more simple forms. In chemistry, the element is a fundamental substance of matter in so far as chemical reactions are concerned. There are 102 of these elementary substances. Thirteen elements compose 99% of the matter in the crust of the earth. These are: Oxygen 49.52%; silicon 25.75%; aluminum 7.51%; iron 4.70%; calcium 3.39%; sodium 2.64%; potassium 2.40%; magnesium 1.94%; hydrogen 0.88%; titanium 0.58%; chlorine 0.19%; phosphorus 0.12%, and carbon 0.094%.

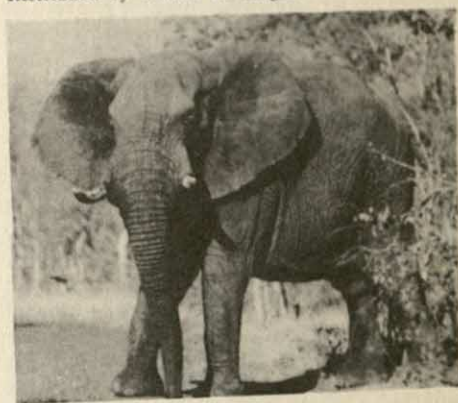
The elements composing the human body and the approximate percentages thereof are as follows: Oxygen, 65%; carbon, 18%; hydrogen, 10%; nitrogen, 3%; calcium, 1.5%; phosphorus, 1.0%; potassium, 0.35%; sulphur, 0.25%; sodium, 0.15%; chlorine, 0.15%; magnesium, 0.05%; iron, 0.004%; copper, 0.0002%; manganese, 0.0003%; and iodine, 0.00004%. Zinc, aluminum, fluorine, silicon, and arsenic, and perhaps other elements may be found present in traces only, and are considered nonessential. Carbon, hydrogen, and oxygen are supplied to the body by carbohydrates, fats, and proteins of the diet; nitrogen and a considerable amount of phosphorus and sulphur are supplied by proteins, and the remaining elements



Courtesy American Museum of Natural History, N. Y.

COLUMBIAN MAMMOTH

Restoration by Charles R. Knight



Courtesy Union of South Africa Govt. Information Office, N. Y.

AFRICAN ELEPHANT

are supplied by the mineral constituents of the natural foods, salts, and, to some extent in variable amounts by drinking water. The mineral elements known to be essential to animal life are sodium, potassium, calcium, magnesium, iron, copper, chlorine, phosphorus, iodine, and possibly manganese and zinc. See also *Atomic Weight*.

Elephant (*ēl'ē-jant*), the largest living land animal, and the sole surviving representative of the suborder Proboscidea. Only two species of the family Elephantidae remain, the Asiatic and the African. The former is distinguished from the latter by its greater height, smaller ears, concave forehead, and four external toes on the hind foot, while the African has three. Elephants, when full grown, are from 9 to 15 ft. high and weigh from 4,000 to 9,000 pounds. They live 100 years and upwards. Elephants have remarkably large bodies, a thick skin, a scant growth of hair, a short neck, an enormous head, large legs and feet, and a proboscis or trunk. The proboscis is a huge elongation of the nose and upper lip, and is composed almost wholly of a mass of muscles, numbering, according to Cuvier, fully

40,000, which give it the greatest diversity of motion. The trunk is very strong and serves alike for respiration, smell, taste, touch, and prehension. At the extremity of the trunk, on the upper surface, are two fingerlike projections with a thick tubercle below, which acts the part of the thumb, the whole forming an organ of prehension comparable in many respects to the human hand.

With the trunk the animal collects food and takes in drink. It exercises extreme caution in using the trunk in combat; without it the animal is helpless, even to feed itself. It breathes through the openings in the trunk, which it can easily hold above the surface of the water while bathing or crossing a stream. Indeed, it is fond of an abundance of water and swims with ease and skill. It has no canine teeth and only two incisors on the upper jaw, which assume the character of tusks and attain an enormous size; a single tusk often weighs from 100 to 200 pounds. These tusks comprise the most elastic and best form of commercial ivory. In some species they attain a length of 7 or 8 ft., and serve to break off small branches, tear climbing plants from trees, loosen roots, fight other animals, and, in a state of domestication, to ply or carry timbers and move stones. Elephants have an ability to run quite equal to that of a horse. In lying down they do not place the hind legs beneath the body, but extend them backward in the manner of a person kneeling. The female breeds at 15 years of age, bearing a single young at a birth; the period of gestation is about 21 months. The young elephant sucks with its mouth and not with the trunk.

Elephants associate together in considerable herds, under the guidance of a single leader, usually the most powerful animal. It gives the alarm in case of peril and controls the movements of the herd. In times of danger the herd is remarkably anxious to protect it, which is done by crowding so eagerly to the front that the hunters often shoot some less valuable individuals before it can be reached. Sometimes an elephant is driven from the herd, and is never allowed to join another, but ever after leads a solitary life. Such individuals are known as *rogues*, or *low-castes*, and are by far the most dangerous to meet. Elephants are domesticated and serve for tiger hunting, beasts of burden, and in time of war. The Romans were frightened when Hannibal brought a troop of elephants over the Alps, but later learned to use them in war and various arts of peace. It is indicated from fossil remains of the genus *elephas* that at least 14 species lived in former times, while the species classed with the allied genus *mastodon* were still more numerous. Fossil remains appear in the Pliocene of North and South America and in the Miocene and Pliocene of Europe, but they became extinct in the Western Hemisphere and emigrated from Europe

to Asia and Africa in the Pleistocene period.

Elephanta (*él-ê-jân'tá*), a small island of British India, in the Bay of Bombay, about 5 m. from the mainland. It is 5 m. in circuit and the surface consists of two hills with a valley between them. Near the main landing place are a number of temples or caves cut into the solid rock. The largest of these is 130 ft. long and 123 ft. broad, the roof is supported by pillars of great magnitudes, and the walls are sculptured with the Hindu trinity, Brahma, Vishnu, and Siva. These temples are used by the Baniya caste for certain Hindu festivals. It is thought that the temples are more recent than the birth of Christ.

Elephant Beetle (*él-ê-jant bē'tl*), a giant beetle of Central America, so named from its large size. The length is about 5 in., including a forked horn which projects from the head. It has a blackish color, but is covered with a yellowish fur. This fur is soft and upright and is easily removed by rubbing, hence most of the specimens are bare and appear almost black.

Elephant Fish (*él-ê-jant fish*), the common name of the *chimaera*, so called from its upper extension of the nose, which resembles a proboscis. The flesh is esteemed as food, for which it is caught off the coast of the Cape of Good Hope and other regions of the South Pacific.

Elephantiasis (*él-ê-jân-tī'à-sis*), a disease of the skin and areolar tissues, epidemic in the East and West Indies. It begins with headache and fever, after which the leg or arm becomes inflamed and tender and serum afterwards exudes. Attacks will follow each other and the affected limb will become very large in size. Some cases are due to malarial infection, while others result from the bite of certain mosquitoes. The elephantiasis of the Greeks is a form of leprosy.

Elephantine (*él-ê-jân-tī'nē*), an island in the upper Nile, opposite Assuan, known anciently as Syene. It is formed of granite covered with a fertile soil, and one mile long. Herodotus mentions it as the boundary between Egypt and Ethiopia, but afterward Phyle was regarded as the southern landmark of Egypt. The island contains many ancient ruins, including several temples, fragments of pottery with Greek inscriptions, and a gateway of the time of Alexander. The Persians as well as the Romans fortified Elephantine as an important strategic point.

Elephant Seal (*él-ê-jant sēl*), the proboscis seal, or sea elephant, so named from the proboscislike projection of the upper lip of the male. It is the largest of the seal family, often attaining a length of 20 to 30 ft. The female is much smaller than the male and has no proboscis. Two species have been described, one found off the coast of western Mexico and California, and the other in the vicinity of the Kerguelen Islands, Heard's Island, and Patagonia. However, both are be-

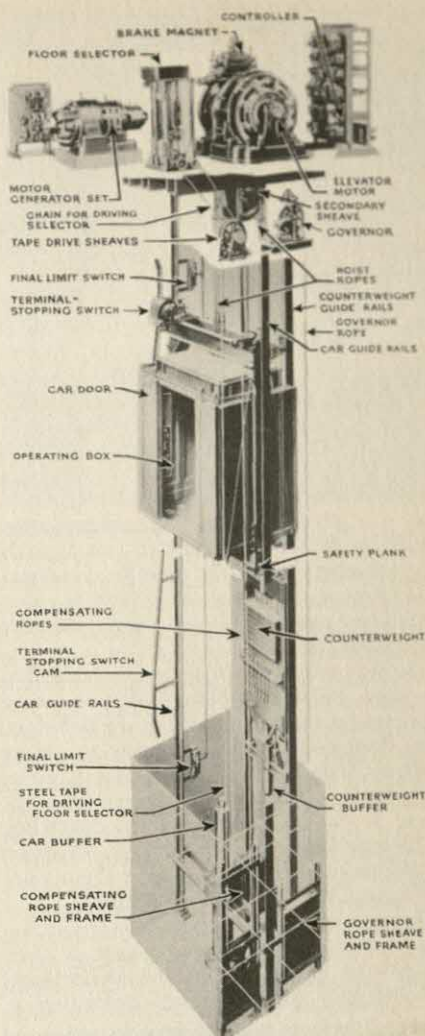
coming rare because of extensive slaughter. These animals are hunted for their oil, which burns with a clear flame, a single individual yielding about 20 gallons. The skin is useful in making harness and other leather products.

Eleusis (*ê-lû'sis*), a celebrated city of ancient Attica, formerly situated on the Bay of Eleusis, near the confines of Megaris, and connected with Athens by the Sacred Road. Its fame is due largely to the festivals observed by the Greeks in honor of Demeter. The *Eleusinian Mysteries*, as the festivals were called, were divided into the greater and lesser, and, according to general account, held every five years. The lessons taught were of the highest moral character and were intended to inculcate the doctrine of the immortality of the soul. It was held that the souls of those who participated in them were filled with sweetest hopes, both of this and the future world, and that in them no one was sad. The ceremonies were awe inspiring, and their secrecy was strictly enjoined by the death penalty. Initiation in the lesser prepared for admittance to the greater, the initiation into both being followed by numerous games given amid great rejoicing.

Eleuthera (*ê-lû'thêr-â*), an island of the Bahamas, about 70 m. long and from 2 to 10 m. wide. The area is 235 sq. m. It produces Eleutheria bark, a bitter aromatic bark sometimes called cascarilla, fruits, live stock, and cereals. Governor's Harbor is the chief town. Population, ca. 6,500.

Elevated Railway (*ê'l'ê-vât-êd*), a means of multipassenger rapid transit developed to provide faster transportation than was possible on city streets. The tracks were laid on a superstructure supported by tall iron columns; and stations, reached by stair, were usually located at least four blocks apart. The trains ran at frequent intervals. In 1867 the first elevated railway, cable driven, was built in New York City; four years later steam locomotives powered it. In Chicago, which already had a steam system, an electric-motor car was introduced in 1895, and in 1897 a multiple-unit system of control was developed. Boston and New York City soon adopted this electrified system. Elevated railways were in widespread use in large American cities for the next 30 years, until other methods of rapid transit (first trolleys, then buses and subways) replaced them. Most of the "els" have been demolished; the last one in New York was torn down in 1955. In Wuppertal, Germany, there is an elevated line using a monorail system, in which the rail is suspended from steel supports and the cars are suspended from this rail on rolling brackets.

Elevator (*ê'l'ê-vâ-tēr*), a mechanical apparatus for vertical transportation of passengers and



Courtesy Otis Elevator Co.

SIGNAL CONTROL PASSENGER ELEVATOR

freight. Modern passenger and freight elevators are operated by electricity and consist of a hoisting machine with a motor and a controller, all connected by wire ropes to a cage with a platform moving up and down in a hoistway; also a counterweight which compensates for a part of the movable load so as to reduce the amount of energy required to move the mass. Various devices to prevent falling of the car and automatic leveling at floor landings are some of the features that have made elevator transportation safe and efficient.

The first elevator with a safety device was invented by Elisha Graves Otis in 1852. Early elevators were operated by belt-driven steam engines, and later directly by reversible steam engines. The first geared hydraulic elevator (1872) was

operated by steam pumps. Later electric pumps, with pressure and discharge tanks, provided car speeds up to 600 ft. per minute, a feat which directly influenced the advent of the skyscraper.

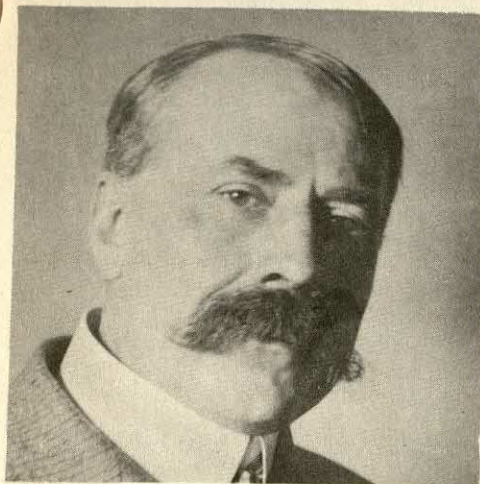
The worm-gear drum type in which the hoisting ropes were wound on a drum was used in 1889, and, in 1902, the gearless traction type operated by means of an electric switch in the car was introduced. With signal control (automatic operation and self-leveling) and other improvements, the gearless electric machine has replaced the hydraulic type.

Many apartment houses and private dwellings are equipped with self-service elevators, which may be operated by passengers through push-button control.

Freight elevators are furnished with a variety of capacities and speeds to suit different conditions, as height of building, weight of goods, etc. Usually the platform is about 8 ft. 4 in. $\times$ 10 ft. 0 in. with capacities of about 4,000 lbs., but capacities of some cars may run up as high as 40,000 lbs., and in some warehouses freight elevators carry loaded trucks.

The highest travel of an elevator is in the Empire State Building in New York City where some passenger elevators travel to the 80th floor. From there short-rise elevators carry passengers up to the 102nd floor, which is 1,250 ft. above street level. Low-depth passenger elevators are located in Carlsbad Caverns, N.M., descending to the main floor of the cave, 750 ft. below the ground, and also in the Cave of the Winds back of Niagara Falls. See *Grain Elevator*.

Elgar (*ĕl'gär*), SIR EDWARD WILLIAM, musician, born Broadheath, England, June 2, 1857; died Feb. 23, 1934. He studied at Littleton House and afterward received private instruction on



EDWARD ELGAR

Courtesy Brown Bros., N. Y.

the violin and the organ. He began as a conductor at Worcester in 1882, and three years later became organist in St. George's Church. In 1889 he gave up these positions and devoted his attention entirely to composition. Many of his works are well known in Canada and the U.S., where they are quite as popular as they are in England. Edward VII knighted him in 1904, and the following year he was granted the degree of doctor of music by Yale Univ. Among his productions are the oratorio "The Light of Life," the cantata "The Black Knight," and the concert overture "Cockaigne." The well-known march "Pomp and Circumstance" was written by him for the coronation of Edward VII.

Elgin (*ĕl'jin*), a city in Kane County, Illinois, on the Fox River, about 36 m. n.w. of Chicago. It is on the Chicago & North Western and the Chicago, Milwaukee, St. Paul and Pacific R.R.'s and on the Chicago, Aurora & Elgin Electric Ry. The noteworthy buildings include Illinois Hospital for the Insane, the Gail Borden Public Library, the Elgin Acad., the Sears Art Gallery, the Elgin Watch Observatory, and the Audubon Museum for Natural History. Among the manufactures are watches, farming implements, dairy and food products, tools, and automotive and screw machine products. It also has thread and shoe factories and meat-packing establishments. Elgin was settled in 1835 and incorporated in 1854. Population, 1940, 38,333; in 1950, 44,223.

Elgin Marbles (*ĕl'jin mār'b'lz*), the celebrated collection of ancient sculptures brought from Greece by Thomas, seventh Earl of Elgin, and purchased in 1816 by Parliament for the British museum at a cost of \$175,000. The sculptures are among the best that adorned certain buildings on the Acropolis of Athens. They include those of Theseus or Hercules, the torso of Cecrops, the Fates, Proserpina, Iris, Ceres, the torsos of Neptune and Minerva, the heads of the horses of Hyperion, and one of the horses of Night. Their removal to England was generally condemned as an act of injustice, a view in which Lord Byron concurred.

Eli (*ĕ'lĭ*), a judge of Israel and a priest at the temple of Shiloh, the predecessor of Samuel. He judged Israel 40 years, but was unable to overcome the reluctance and rapacity of his sons, Hophni and Phinehas, which displeased the people. The Philistines took advantage of his weakened authority by advancing against Israel. They gained a complete victory in the Battle of Ebenezer, slew both of Eli's sons, and carried off the ark of God. When Eli heard the news, he fell from his seat and died, being then 98 years of age. See 1 Sam. 4:15-18.

Elias (*ĕ-lĭ'as*), the name of the prophet Elijah (*q.v.*) used in the New Testament.

Elijah (*ē-lī'jā*), called Elias in the New Testament, the greatest and sternest of the prophets of Israel, born at Tishbe, in Gilead. His history is given in connection with the reigns of Ahab (1 Kings 17-21) and his successor Ahaziah (2 Kings 1-2). He flourished in the time of Ahab about 920 B.C. When that monarch had introduced the worship of Baal, Elijah pronounced a curse on the land, and was obliged to flee for safety. He took refuge by the brook Cherith, where he was miraculously fed by ravens. Subsequently he went to Zarephath and stayed at the home of a widow, prolonged her supply of oil and meal, and restored her son to health. An extended drought and famine led to a reconciliation with Ahab. Soon after, he demonstrated the vanity of the worship of Baal. This caused the people to destroy the idolatrous prophets, a circumstance leading Queen Jezebel, wife of Ahab, to vow vengeance. To escape her anger, he fled to Mt. Horeb and hid in a cave, where Jehovah instructed him and advised the selection of Elisha as his successor. When Ahab wrongfully took possession of Naboth's vineyard, Elijah denounced the monarch and pronounced a curse upon him and his wife. Later he denounced the son and heir of Ahab, Ahaziah, who vainly sought to destroy him. He visited the prophets at Bethel and proceeded with Elisha across the Jordan. While there, a chariot and horses of fire appeared, and he was taken up by a whirlwind into heaven. According to Jewish tradition, he is to return for the restoration of Israel; thus, he is expected to appear at each celebration of the Seder night at the Passover (*q.v.*) festival. Christians, however, hold that prophecy was fulfilled by the advent of John the Baptist. In the transfiguration of Christ, Elijah appeared on the Mount, with the Savior and Moses.

Elijah is by far the most popular of the prophets of the Old Testament because it was he who indirectly prepared the way for the prophetic movement of Amos and Hosea. His intense personality left its imprint on the concept of the Jewish prophet. Many medieval miniatures, which depict not one other figure of the Old Testament besides Moses, portray Elijah and his various miracles.

Eliot (*ē'lī-ūt*), CHARLES WILLIAM, educator, born in Boston, Mass., Mar. 20, 1834; died in Northeast Harbor, Me., Aug. 22, 1926. A graduate of Harvard (1853), he tutored in mathematics there (1854-58), served as assistant professor of mathematics and chemistry in the Lawrence Scientific School, Harvard (1858-63), and as professor of analytical chemistry in the Massachusetts Institute of Technology (1865-69). From 1869 to 1909 he was president of Harvard Univ. One of the greatest educators in American history, he introduced many basic reforms; he developed the



CHARLES W. ELIOT

so-called elective system which entitles students to choose (within groups) any of the subjects in the curriculum; he abbreviated the Harvard Coll. term from four to three years; he reformed the administration of athletics, etc. He was the author of: "The Happy Life" (1896), "Educational Reform" (1898), and "The Durable Satisfaction of Life" (1910). He is perhaps most widely known as editor of the "Harvard Classics" ("five-foot shelf"), a collection of classics in various fields of culture.

Eliot, GEORGE, the literary name assumed by Marian Evans, novelist, born in Warwickshire, England, Nov. 22, 1819; died in London, Dec. 22, 1880. She was the daughter of Robert Evans, a land agent and surveyor, and a man of strongly marked traits of character. At the death of her mother, in 1836, she assumed management of the house. She attended school at Nuneaton and Coventry, though her culture was largely self-acquired through a passionate habit of reading and study. She removed with her father to Coventry in 1841, where she made the acquaintance of Charles Bray, an author of several standard works in philosophy, and formed a close friendship with his family. Soon after the death of her father, in 1849, she traveled through Switzerland, and, returning to England, began to write for the *Westminster Review*. Her writings attracted the attention of John Stuart Mill, Herbert Spencer, and George Henry Lewes, who gave them favorable mention. She formed an irregular marriage union with the last mentioned, which remained unbroken until his death in 1878. His decease was largely the cause of her withdrawal from the conventional forms of society, and perhaps prompted her to give a larger share of attention to literary work.

Among the best works of George Eliot are her translations from the German, in 1846, of

Strauss's "The Life of Jesus" and "The Essence of Christianity." After completing these works, she declared herself highly interested in the beautiful story of the former. Several sketches contributed by her to *Blackwood's Magazine* in 1857



Courtesy British Information Services, N. Y.

GEORGE ELIOT

attracted much attention. Two years later her novel of real life, "Adam Bede," gave her a reputation for masterly insight into character and remarkable knowledge of human nature, combined with much power of description. This work fixed her place among the eminent novelists, and still remains the most popular of her productions. Soon after appeared: "The Mill on the Floss," "Silas Marner," "Romola," "Felix Holt," "Middlemarch," "Daniel Deronda," and "Impressions of Theophrastus Such." Among her poetical works are: "The Legend of Jubal," "The Spanish Gypsy," and "Agatha." Her productions in poetry are quite equal to her prose, though the prose writings contain greater power of imaginative creation and a more delicate finish. In 1880 she married John Walter Cross, an intimate friend, but died soon after. An extensive biography, entitled "George Eliot's Life as Related in Her Letters and Journals," was published by him shortly after her death.

Eliot, JOHN, minister, born in Hertfordshire, England, in 1604; died in Roxbury, Mass., May 20, 1690. He was educated at Cambridge, where he obtained a bachelor's degree in 1623, and in 1631 emigrated to America. He officiated for a

year in the first church of Boston, and in 1632 received an appointment as pastor of the church in Roxbury, where he remained until his death. He became interested in studying the Indian language by means of an interpreter, and in 1646 was able to preach the gospel to the Indians in their own language. While engaged in his ministerial work, he made a translation of the Bible into the Indian language, completing the New Testament in 1661 and the Old Testament two years later. The "Indian Version of the Scriptures," published at Cambridge, Mass., was the first book printed in New England. About 3,500 Indians were converted to Christianity through his work, though the ill feeling which developed against the English during King Philip's War, in 1675, caused many to fall back into their old ways. He published numerous works on Christianity, logic, and Indian history.

Eliot, SIR JOHN, statesman, born at Port Eliot, England, Apr. 20, 1592; died Nov. 27, 1632. He was the son of a country gentleman, received a liberal education, and traveled extensively through France, Germany, and Italy. At the early age of 22 he entered Parliament, and when 27 was appointed vice admiral of Devon. He was again elected to Parliament in 1624 as a supporter of the Duke of Buckingham, but soon after became at variance with him, owing to the close friendship of the duke with Charles I, who refused to acknowledge that in the House of Commons is vested the principal ruling power of the nation. The vigorous and able statesmanship of Eliot made him the leader of Parliament against the encroachment of the king, and secured the adoption of its policy and the impeachment of Buckingham. He was imprisoned in the Tower for nine days on account of his persistent opposition in this struggle against the claims of the house of Stuart, but in 1628 the House of Commons wrung from the king the second charter of liberty, the right of petition, mainly through his vigorous agitation. By this charter the king gave up all claim to the power of levying taxes and was denied the authority to imprison a subject at will, as well as the right to quarter soldiers in any house without the consent of the owner. After a short time Charles I disregarded the charter. Eliot was again sent to the Tower in 1629, where he remained until his death.

Eliot, SAMUEL, historian and educator, born in Boston, Mass., Dec. 22, 1821; died Sept. 15, 1898. He was graduated from Harvard in 1839, traveled in Europe four years, and in 1856 became professor of history and political science at Trinity Coll. He was its president in 1860-66, and in 1864-74 lectured on constitutional law and political science in the same institution. In 1870-73 he was professor at Harvard, served as master of the Boston Girls' High School in 1872-76, and

was superintendent of the Boston public schools in 1878-80. He was overseer of Harvard, 1866-72, serving also as president of the American Social Science Assn. He had considerable influence upon the schools of his state. Among his publications are "The History of Liberty" and "The American Nation."

Eliot, THOMAS STEARNS, poet, critic, born at St. Louis, Mo., Sept. 26, 1888. After study at Harvard, the Sorbonne, and Oxford Univ., he settled in London in 1914, becoming a British subject in 1927. He edited *The Criterion* from 1923 to 1929.



Al Gretz Photo from Keystone Pictures Inc.

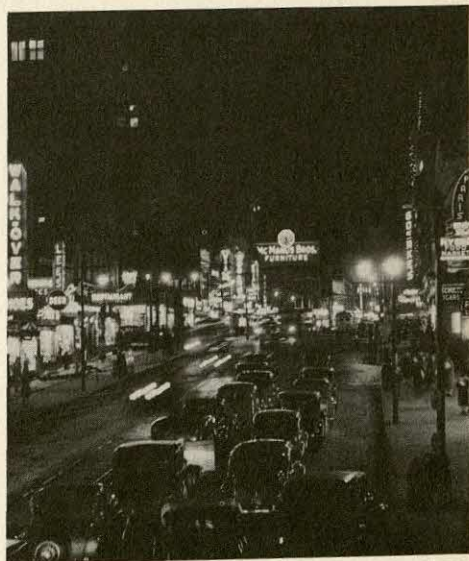
T. S. ELIOT

His books of poetry include "Prufrock and Other Observations" (1917), "Poems" (1919), "The Waste Land" (1922), "Ash Wednesday" (1930). "Four Quartets" (1943), and three plays in verse, "Murder in the Cathedral" (1935), "The Family Reunion" (1939), and "The Cocktail Party" (voted the best foreign play of the 1949-50 season by the N.Y. Drama Critics Circle). Among his critical works are "The Sacred Wood" (1920), "An Essay of Poetic Drama" (1928), "Dante" (1929), "Elizabethan Essays" (1934), "Essays Ancient and Modern" (1936), and "Notes Toward the Definition of Culture" (1949). Eliot has been frequently criticized, not only for the obscure and bookish qualities of his verse, but also for his regressive economic and religious views. Nevertheless, during the decade which followed World War I, he was certainly the most influential figure in American letters, both as a poet and as a critic. For the writers and intellectuals of the twenties, "The Waste Land," with its bitter-sweet echoes of French symbolism, the Elizabethans and Metaphysicians, and pagan mythology, appeared to epitomize the barren confusion of modern civilization. In 1948 he was awarded the Nobel Prize in literature.

Elisha (*ē-lī'shā*), a prophet of Israel, chosen by Elijah as his companion and successor. Like Elijah, he strongly opposed the Baal cult. He was loved and venerated and was credited with many miracles, including those of prediction, healing of the sick, and raising of the dead. He is believed to have died in 140 B.C. His history is given in 2 Kings.

Elizabeth (*ē-līz'ə-bēth*), a city in northeastern New Jersey, seat of Union County, on Arthur Kill and Newark Bay, adjoining Newark and linked to Staten Island, New York, by the Goethals Bridge. It is served by the Pennsylvania, Baltimore & Ohio, and Central of New Jersey R.R.'s; Newark Airport is 3 m. E. of the city. Elizabeth is an important industrial city and a rail and shipping center. Port Elizabeth, a \$100,000,000 pier complex, began operations in 1962. The diversified industries include shipyards and railroad shops, oil refineries, steel mills, foundries, and the manufacture of sewing machines, chemicals, machinery, fabricated metals, and printing presses. Elizabeth is part of the New York-Northeastern New Jersey Consolidated Area. The city had a value added by manufacture in 1958 of \$156,453,000.

Elizabeth is the oldest English settlement in the state. The site was purchased in 1664 and in 1665 became the provincial capital. Points of interest include the First Presbyterian Church (restored in 1946), where the first general assembly of New Jersey met from 1668 to 1682; the Belcher mansion (ca. 1742), the Boudinot mansion (ca. 1752), and the Nathaniel Bonnell house (before 1682). The Coll. of New Jersey (now Princeton Univ.)



Courtesy Ewing Galloway, N. Y.

DOWNTOWN SECTION OF ELIZABETH, N. J.

was founded here in 1746. The settlement was the site of four Revolutionary War battles. It was incorporated as the borough of Elizabethtown in 1739, as a town in 1796, and as a city in 1855. Population, 1950, 112,817; in 1960, 107,698.

Elizabeth, SAINT, born in Pressburg, Austria, in 1207; died in Marburg, Germany, Nov. 17, 1231. The daughter of Andrew II, king of Hungary, she was betrothed at the age of four to Louis IV, landgrave of Thuringia, brought up in his home, and married at 14. Devoting herself to charity and religion, she converted her husband. After his death (1227) as a Crusader, Elizabeth was driven from Thuringia by his brother, Henry Raspe, and lived thereafter at Marburg. She was canonized by Pope Gregory IX in 1235.

Elizabeth (ELISABETH AMALIE EUGENIE), empress of Austria, wife of Francis Joseph, born at the castle of Possenhofen, Bavaria, Dec. 24, 1837; assassinated in Geneva, Switzerland, Sept. 10, 1898. She was the daughter of Duke Maximilian Joseph of Bavaria, of the royal house of Wittelsbach. Marrying Francis Joseph in 1854, she became highly popular with the people of Austria and of Hungary, of which she became queen in 1867. She was stabbed to death by an Italian anarchist, Luigi Luccheni.

Elizabeth, queen of England, daughter of Henry VIII and Anne Boleyn, born at Greenwich, Sept. 7, 1533; died March 24, 1603. She was three years old at the time of her mother's death, when she was declared illegitimate, since Anne's marriage to Henry was then invalidated. Elizabeth was, however, later placed in the order of succession after her younger brother, Prince

Edward, and elder sister, Mary. When Edward VI ascended the throne, she was placed in care of Catherine Parr, the queen dowager, and later was taken to Hatfield, where she obtained a classical education under such eminent teachers as William Grindal and Roger Ascham. Besides learning music and science, she learned to converse freely in German, French, Latin, and Greek. During Mary's reign she found it expedient to profess the Roman Catholic faith, though her inclination to Protestantism was obvious. Immediately after the death of Mary, Nov. 17, 1558, she was recognized as queen by Parliament amid much rejoicing of the Protestants and with the approval of moderate Catholics. Her ascent was followed by the re-establishment of the ecclesiastical system devised during her father's reign, and the act of uniformity enforced the revised prayer book. She declared her intention to live and die a virgin, though she was approached by Parliament on the serious question of the succession to the crown and had numerous suitors, among them Eric, King of Sweden, Philip of Spain, Henry III of France, and Archduke Charles of Austria.

The reign of Elizabeth places her among the shrewdest and most important English rulers. The growth of Great Britain into a world power is due largely to the wisdom she exercised in engaging as her advisers the ablest men of the kingdom. Among the unfortunate events may be named the jealousy that existed between her and Mary, Queen of Scots, which resulted in the beheading of the latter, and the many persecutions to which the Catholics were subjected. On the other hand are numerous facts of history that make her a most distinguished character in influence and power, such as the destruction of the Spanish Armada in 1588. Her extensive influence at the courts of France, Holland, and other countries made her a potent factor in the political affairs of Europe.

The "Elizabethan age" in English history will always be considered one of the periods of greatest civilization of all times. Cultural life, made possible through the strong increase in political power which her ingenious politics created, was at a peak. Her reign alone brought forth the architectural style named after her, the blossoming of the dramatic arts highlighted by the work of Shakespeare (*q.v.*), and the refinement of English court life with its brilliant fashions and entertainments.

It may be said that Elizabeth was actually the sovereign under whose reign the Renaissance in England began. Until then, England had still been rather medieval in cultural respects, almost a century behind in development in comparison with the southern and western parts of Europe.

Elizabeth II (ELIZABETH ALEXANDRA MARY),

ELIZABETH, QUEEN OF ENGLAND

Courtesy Metropolitan Museum of Art, N. Y.





ELIZABETH II

queen of the United Kingdom and Northern Ireland and of her other realms and territories, head of the Commonwealth, born in London, April 21, 1926. The daughter of George VI, she was married Nov. 20, 1947, to Philip Mountbatten (see *Philip, Duke of Edinburgh*), who had been created duke of Edinburgh the previous day. They have several children, the eldest being Prince Charles (prince of Wales and heir apparent), born Nov. 14, 1948. Elizabeth was crowned on June 2, 1953. In 1953-54 she toured the Commonwealth. In 1957 she visited Canada, addressed the U.N. General Assembly in New York, and visited Washington, D.C. In June 1959 she presided, with President Eisenhower, at the dedication of the St. Lawrence Seaway (*q.v.*).

Elizabeth (PAULINE ELISABETH OTTILIE LUISE), queen of Rumania, born in Neuwied, Germany, Dec. 29, 1843; died in Bucharest, Rumania, March 2, 1916. In 1869 she married Prince Carol of Rumania, who became king in 1881. As queen she did much for the welfare of the Rumanian people, sponsoring the establishment of schools and charitable institutions and fostering cultural development. Under the pseudonym Carmen Sylva, she was a prolific writer. Among her works are "*Pensées d'une Reine*" ("The Thoughts of a Queen," 1882), "*The Bard of Dimbovitza*" (an English collection of Rumanian folk songs, 1889), and, with Mite Kremnitz under the joint pseudonym Dito and Idem, the play "*Anna Boleyn*" and the novel "*Astra*" (both 1886).

Elizabeth City, a city in northeastern North Carolina, seat of Pasquotank County, on the Pasquotank River and Albemarle Sound, 45 m. s. of Norfolk, Va. It is a port of entry and is served by the Norfolk-Southern R.R.; Elizabeth City Airport is 3 m. s.e. of the city. The business and commercial center of the Albemarle area of North Carolina, Elizabeth City has industries including shipbuilding and the manufacture of lumber and paper products, candy, furniture, textiles, and ma-

chinery. The value added by manufacture in 1958 was \$3,038,000. The surrounding agricultural area produces corn and other grains, soybeans, and truck crops. The city is a popular resort, located in the heart of an area rich in historic landmarks. It is the site of Christ Episcopal Church, noted for its stained-glass windows; and the Old Brick House, connected with tales of the pirate Blackbeard. It is also within easy reach of national recreation sites, memorials, and wildlife refuges. The site was settled in 1663 and chartered as the town of Reding in 1793. In 1794 it was renamed Elizabeth Town and in 1799 made the county seat. The name Elizabeth City was adopted in 1801. Population, in 1950, 12,685; in 1960, 14,062.

Elizabeth Islands, a group of 16 islands between Vineyard Sound and Buzzard's Bay, belonging to Dukes County, Massachusetts, best known as summer resorts. Naushon has an area of 8 sq. m., is the largest of the group, and contains handsome private and summer residences. Population, ca. 150.

Elizabeth Petrovna, empress of Russia, born near Moscow, Dec. 18, 1709; died in Moscow, Jan. 5, 1762. The daughter of Peter the Great and Catherine I, she seized the throne in 1741. She supported Maria Theresa of Austria in the War of the Austrian Succession (*q.v.*) and was instrumental in bringing about the Peace of Aix-la-Chapelle in 1748. She allied Russia with Austria and France against Prussia in the Seven Years' War (*q.v.*) but did not live to see its conclusion. A devoted patron of the arts, Elizabeth established the Univ. of Moscow and the Acad. of Fine Arts at St. Petersburg (now Leningrad).

Elizabeth Stuart (*stu'ert*), queen of Bohemia, born in Fifeshire, England, Aug. 19, 1596; died in England, Feb. 13, 1662. The daughter of James I of England, she married Frederick V of Bohemia (Frederick the Winter King, 1619-20) on Feb. 14, 1613. Through her daughter Sophia, she was the ancestress of the English Hanover dynasty. See also *England*.

Elk (*ēlk*) or MOOSE DEER, largest living species of the deer family, native to Europe and Asia. It stands about 6 ft. and averages 1,000 lb. in weight. In all species the head is large, fully 2 ft. long. The prominent horns branch out almost from the base into a broad, palmate form with numerous tines. A single antler may weigh up to 50 or 60 lb. The neck is short and thick, the legs are long, and the gait is a shambling trot. The elk is timid except when wounded, when it becomes aggressive. The flesh is considered an excellent form of venison.

The so-called American elk, properly called the wapiti (*q.v.*) and more nearly resembling the red deer, does not belong to the elk class. The Irish elk, now extinct, was closely allied to the fallow

deer. Remains have been found in Great Britain and western Europe. It was remarkable for its antlers, which in some specimens measured as much as 11 ft. from tip to tip.

Elkhart (*ĕl'k'hart*), a city in north central Indiana, in Elkhart County, at the confluence of the St. Joseph and Elkhart rivers, 18 m. E. of South Bend. It is served by the New York Central R.R. An industrial and commercial center, Elkhart manufactures pharmaceuticals, band instruments, mobile homes, electronic and electrical components, machinery, and rubber products. In 1958 it had a value added by manufacture of \$176,435,000. It was incorporated in 1858. Population, 1950, 35,646; in 1960, 40,274.

Elkhorn (*ĕl'k'horn*), a river in Nebraska, rising in Rock County. It flows generally southwestward, joining the Platte River ca. 20 m. W. of Omaha after a course of ca. 200 m. Logan Creek is a tributary. The valley of the Elkhorn is fertile farming country.

Elkins (*ĕl'kinz*), a city in north central West Virginia, seat of Randolph County, ca. 35 m. S.E. of Clarksburg. It is served by the Baltimore & Ohio and the Western Maryland R.R.'s. Located in a timber and coal-mining area, the city is a distribution center; its industries include railroad shops, tanneries, and foundries, and the manufacture of furniture and lumber products, brick and tile, and limestone products. Incorporated in 1890, Elkins is the seat of Davis and Elkins Coll. and a gateway to Monongahela National Forest. Population, 1950, 9,121; in 1960, 8,307.

Elks, BENEVOLENT AND PROTECTIVE ORDER OF, a fraternal and service organization founded in New York, N.Y., in 1868. The order has more than 2,000 lodges and a membership of more than 1,000,000. Through the Elks National Foundation, a nationwide trust fund, it carries on programs of support for charities, rehabilitation of handicapped children, aid to veterans, and provision of educational scholarships. Its official organ, the *Elks Magazine*, is a monthly publication. The organization maintains headquarters in Chicago, Ill.

Ell (*ĕl*), a unit of length, formerly used for the measurement of cloth. In the U.S. and Great Britain the ell is considered to be equal to 45 in. The elle, a length unit used in The Netherlands, is only about 27 in., while the Bavarian elle is 33 in. and the Prussian elle 26 in.

Ellerman (*ĕl'ĕr-man*), FERDINAND, astronomer, born in Centralia, Ill., May 13, 1869; died Mar. 20, 1940. In 1895 Ellerman helped Dr. George Hale establish the Yerkes Observatory at Williams Bay, Wis. He spent several years there, leaving in 1904 to collect equipment for the Mt. Wilson Observatory near Los Angeles, Cal. He remained at the Mt. Wilson Observatory until his retirement in 1937. A pioneer in modern

solar photography, Ellerman was internationally acclaimed for his photography of the total eclipse of the sun in 1900.

Ellesmere Land (*ĕlz'mĕr lānd*), the name of a large tract of land in the Arctic region of North America. It is located north of Jones Sound and west of Greenland, from which it is separated by Smith Sound. It is part of the northernmost region of the Western Hemisphere and consists chiefly of a barren and uninhabited plateau. William Baffin visited it in 1616. When it was partly explored in 1899, it was found that Hayes Sound does not separate it from Grinnell Land, which lies immediately north.

Ellet (*ĕl'ĕt*), CHARLES, civil engineer, born in Bucks County, Pennsylvania, Jan. 10, 1810; died June 21, 1862. Chief engineer of the James River & Kanawha Canal, he constructed a wire suspension bridge, the first in America, across the Schuylkill River in Philadelphia in 1842. He built a span of 960 ft. across the Ohio River at Wheeling, and planned the suspension bridge across the Niagara Gorge (1845). In the Civil War he became a colonel of engineers. By equipping several steamboats as rams, he defeated a similarly equipped Confederate fleet, and thus facilitated the capture of Memphis. He was wounded, however, and died shortly thereafter at Cairo, Ill. He wrote an important book on "Coast and Harbor Defenses."

Elliott (*ĕl'ĭ-ut*), JESSE DUNCAN, naval officer, born in Maryland in 1782; died Dec. 18, 1845. He studied at Carlisle, Pa., and in 1804 joined the U.S. Navy as a midshipman. In the War of 1812 he won several victories for the Americans on the Great Lakes. He was second in command to Perry in the Battle of Lake Erie in 1813, and the same year succeeded to the command of the Lake Erie fleet. In 1815 he commanded the sloop of war *Ontario* under Decatur in the war against Algiers, and three years later was made a captain. After a four-year suspension from duty, in 1843 he was placed in charge of the Philadelphia navy yard.

Ellipse (*ĕl-lĭps'*), an important figure in geometry. It is a plane curve, such that the sum of the distances from any point on the curve to two fixed points is constant. These two points are called the *foci*, each being a *focus*. The diameter drawn through them is the major axis; the minor axis bisects the major at right angles. The distance from the center to the foci divided by the semi-major axis is called the *eccentricity* of an ellipse. The less the eccentricity, the nearer the figure approaches a circle. Kepler made the discovery that the planets' orbits around the sun are ellipses, the sun occupying a position in one of the foci.

Ellipsis (*ĕ-lĭp'sis*), Greek meaning omission, in grammar a term used to signify the omission of words necessary to complete the sentence

structure, as: (I) thank you; she is not so tall as I (am).

Ellis (*el'lis*), GEORGE EDWARD, historian and author, born in Boston, Mass., Aug. 8, 1814; died there Dec. 20, 1894. He was graduated from Harvard, studied at the Divinity School, and was ordained a minister. In 1840 he became pastor of the Harvard Unitarian Church at Charlestown, Mass., and was professor of systematic theology in the Harvard Divinity School in 1857-63. He contributed to many periodicals and published a number of books, principally biography and history. His writings include: "Memoirs of Jared Sparks," "A Half Century of Unitarian Controversy," and "History of the Battle of Bunker Hill."

Ellis, HENRY HAVELOCK, scientist, writer, born in Croydon, England, Feb. 2, 1859; died near Ipswich, July 8, 1939. After preparing for a medical career, he went to Australia as a teacher, later returning to England to devote himself to writing. His experiments in the fields of sexual psychology and sociology were embodied in "Studies in the Psychology of Sex," a definitive work comprising seven volumes which were published between 1898 and 1928.

Among his other publications are "The World of Dreams" (1911), "Essays in Wartime" (1916), "Little Essays of Love and Virtue" (1922), "The Dance of Life" (1923), "The Fountain of Life" (1930), and "Sex in Relation to Society" (1937).

Ellis Island (*el'is i'land*), a small island in New York Bay, ca. 1 m. s.w. of the end of lower Manhattan, formerly used by the U.S. as an immigrant station. See *Castle Garden*.

Ellsberg (*elz'berg*), EDWARD, engineer, naval officer, and author, born in New Haven, Conn., Nov. 21, 1891. After graduating from the U.S. Naval Acad. in 1914, he served with the Navy until 1926, attaining the rank of commander by a special congressional act (1929). He was assigned to study naval architecture and the design of military ships. He assisted in salvaging the U.S. submarines S-51 (1926) and S-4 (1927). He was employed (1926-35) by a private oil company and later worked as a consulting engineer until the U.S. entered World War II, when he was reappointed to the Navy. During the war he participated in several important sea salvage and construction operations. He also invented an underwater torch for cutting steel and a method for cracking crude oil to produce antiknock gasoline.

Out of his work came the subject matter for many books, including "On the Bottom" (1929), "Pigboats" (1931), "Hell on Ice" (1938), "Captain Paul" (1941), and "Mid Watch" (1954).

Ellsworth (*elz'wúth*), EPHRAIM ELMER, soldier, born in Mechanicsville, N.Y., April 23, 1837; died in Alexandria, Va., May 24, 1861. He went to Chicago as a young man and, later, to New

York, where he became colonel of a Zouave regiment which he organized among volunteer firemen. During the Civil War he was stationed at Alexandria, Va., where he was killed by a hotel keeper while in the act of tearing a Confederate flag from the building. The people of the North regarded him as the first martyr of the Union cause, and he was buried with military ceremonies from the White House.

Ellsworth, LINCOLN, Arctic explorer, born in Chicago, Ill., May 12, 1880; died in New York, N.Y., May 26, 1951. A graduate of Columbia Univ., he first engaged in railroad surveying, prospecting, and mining engineering (1902-24). Johns Hopkins Univ. sent him to make a geological cross-sectional survey of the Andes Mts. (1924), and, in 1925, he made a seaplane flight to within 136 m. of the North Pole. The next year the Amundsen-Ellsworth-Nobile Transpolar Expedition crossed the Pole in a 71-hour flight from Svalbard to Alaska. He also flew over the South Pole and was the first man in history to fly over both poles. Ellsworth, in 1935 and 1939, discovered 381,000 sq. m. of unknown, antarctic territory which he claimed for the U.S. He described his expeditions in several publications, including "Beyond Horizons" (1938).

Ellsworth, OLIVER, statesman and jurist, born in Windsor, Conn., April 29, 1745; died there, Nov. 26, 1807. He studied at Yale and Princeton, and was admitted to the Connecticut bar in 1771. In 1775 he became a representative in the Connecticut general assembly and subsequently served in judicial posts in that state. Beginning in 1777 he served for six years as a representative to the Continental Congress, and in 1787 he was chosen to represent his state in the Constitutional Convention, in which he took an active part; it was



Courtesy Doubleday & Co., N.Y.

LINCOLN ELLSWORTH

he who suggested that the term United States be used to designate the Federal government and that the states be equally represented in the Senate, regardless of size and population. He was Senator from Connecticut (1789-96) and was Chief Justice of the Supreme Court (1796-99).

Ellwood (*el'wōd*), THOMAS CROWELL, author, born in Crowell, Oxfordshire, England, in 1639; died in Amersham, Buckinghamshire, March 1, 1714. He was a Quaker and, for this reason, had to suffer periods of imprisonment. In 1662 he was chosen as a reader to John Milton (*q.v.*), but his story that he suggested "Paradise Regained" to the poet is improbable. He wrote several books defending Quakerism, including "The Foundation of Tithes Shaken" (1678) and "Truth Defended" (1695).

Elm (*elm*), a genus of trees which includes 13 well-marked species, all native to the North Temperate Zone. In most species, the branches are numerous and spreading, the bark is rugged, and the leaves are alternate, ovate, and doubly serrate. The flowers are small, but numerous and in clusters, and the fruit is either a small, one-sided nut, forming a winged samara, or a drupe. Elm wood is compact and very durable in water. The trees commonly grow to a height of 50 to 100 ft. The white elm is widely used in cheaper grades of furniture. Native to North America are the American elm, a common shade tree, the slippery—or red—elm, which has a thick mucilaginous bark, and other varieties. The wych—or Scotch—elm and the English elm are native European trees. The planting of elm trees has been found uneconomical in the U.S. because of the widening prevalence of Dutch elm disease, a fungoid condition spread by bark beetles and very difficult and expensive to control.

Elman (*el'man*), MISCHA, violinist, born in Talnoye, Russia, Jan. 20, 1891. He gave his first recital at the age of five. Later he studied with Alexander Fiedelmann at Odessa and with Leopold Auer at the St. Petersburg (now Leningrad) Conservatory. Acclaimed from his first appearance as a soloist in Berlin, Germany, in 1904, Elman made a tour of Europe and in 1908 played in New York City with the Russian Symphony Orchestra. Thereafter he made New York his home and became a U.S. citizen in 1923. In 1958 he marked his 50th anniversary at a concert at Carnegie Hall, New York.

Elmira (*el-mi'ra*), a city in southern New York, seat of Chemung County, on the Chemung River, 60 m. w. of Binghamton. It is served by the Erie, the Pennsylvania, and the Delaware, Lackawanna & Western R.R.'s; Chemung County Airport is ca. 11 m. n.w. of the city. An industrial center, Elmira produces electronic tubes, office machines, glass containers, automotive parts, valves, fire-fighting equipment, and structural



MISCHA ELMAN

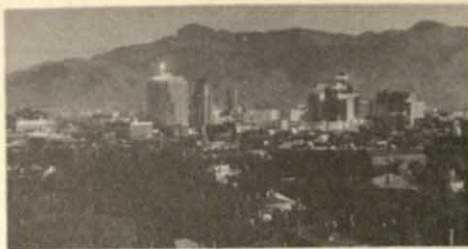
Wide World Photos

steel. The value added by manufacture in 1958 was \$90,482,000. The surrounding area is devoted to dairying, and salt is mined. The city is the seat of Elmira Coll. (for women) and Elmira State Reformatory, and the burial place of Samuel L. Clemens (Mark Twain). The site was settled in 1788 as Newtown; it was renamed Elmira in 1828 and chartered as a city in 1864. The battle of Newtown was fought (1779) in the area, and in the Civil War Elmira had a prison camp for Confederate soldiers. Population, 1950, 49,716; in 1960, 46,517.

Elmo's Fire (*el'mōz fir*), SAINT, the popular name of a meteorological or electrical phenomenon usually observed during thunderstorms at the top of shipmasts or other high, pointed objects. It is caused by electrical currents in exceptional atmospheric conditions and appears in the form of either one or two flames.

Elohim (*ē-lō'him*), in the Bible, a Hebrew name for God, especially the one God of Israel, the other name being Yahweh (see *Jehovah*). According to Jewish tradition, Elohim stands for God's quality of might and justice, whereas Yahweh refers to His quality of love and eternity. Originally a Canaanite word, Elohim referred to heathen gods in patriarchal times. Modern Bible criticism distinguishes the dates of some of the interwoven parts of the Books of Genesis, Exodus, Numbers, Deuteronomy, and Joshua by whether God is called Elohim or Yahweh. Both names are translated as Jehovah in English versions of the Bible.

El Paso (*el pās'ō*), a city in western Texas, seat of El Paso County, on the Rio Grande opposite Juarez, Mexico, 270 m. s. of Albuquerque, N.M. A port of entry and headquarters of the El Paso customs collection district, it is served by the Southern Pacific and Texas and Pacific R.R.'s and the Santa Fe Ry. It is the northern terminus of the Inter-American section of the Pan-American Highway linking the Americas. El Paso Inter-



EL PASO, TEXAS

Downtown area with Juárez Mts. across the Rio Grande, in Mexico

national Airport is situated 9 m. E. of the city.

Lying at the base of Mt. Franklin, El Paso is 3,762 ft. above sea level and has an area of 114.6 sq. m. Its parks include Washington Park and Zoo, Ascarate Park, and MacKelligon Canyon. The city is in the heart of the old Spanish mission country and within easy reach of Big Bend and Carlsbad Caverns national parks, White Sands National Monument, and Ruidoso, a mountain resort. Nearby are Biggs Air Force Base, Ft. Bliss, William Beaumont Army Hospital, and Elephant Butte Dam on the Rio Grande. A 42-ft. statue of Cristo Rey, or Christ the King, stands on the mountain of the same name.

The city's industry centers around copper and oil refining, copper smelting, and the manufacture of clothing, petroleum products, target scopes, and meat products. The surrounding area produces cotton, pecans, alfalfa, and truck crops. The city is the center of the El Paso standard metropolitan statistical area (1,054 sq. m.; pop., 1960, 314,070), including all of El Paso County, which had a value added by manufacture in 1958 of \$91,144,000; the figure for the city alone was \$90,294,000.

El Paso's public and parochial schools enroll ca. 60,000 students annually. The city is the seat of Texas Western Coll. of the Univ. of Texas and of St. Patrick's (Roman Catholic) Cathedral. It is governed by a mayor and council under a charter dating from 1917.

About 1536 the Spaniard Álar Núñez Cabeza de Vaca discovered El Paso del Norte, or the Pass of the North, site of a natural pass in the mountains, and the first white settlement was begun in 1632, on the site of what is now Juárez, Mexico. On the Texas side, Juan María Ponce de León acquired land on the north bank of the Rio Grande in 1827 and established a ranch that became known as El Paso del Río. This settlement was named Franklin ca. 1852, but in 1859 it was renamed El Paso. The city was incorporated in 1873, and in 1881 the railroad arrived.

The population of El Paso grew from ca. 300 in 1853 to 16,000 in 1890. The city's decades of greatest growth were 1910-20, when the population rose from 24,886 to 77,560; and 1950-60, when it rose from 130,485 to 276,687, largely

ELSSLER

as a result of the expansion of military installations in the area.

Elphinstone (ɛl'fɪn-stɒn), WILLIAM, prelate and statesman, born in Glasgow, Scotland, in 1431; died in Edinburgh, Oct. 25, 1514. Educated at the Univ. of Glasgow, he was ordained a priest ca. 1465 and subsequently studied law at the Univ. of Paris. Returning to Scotland, he became (1481) bishop of Ross and was (1483-1514) bishop of Aberdeen. As a member of the Scottish Parliament, he was sent on several diplomatic missions to England and France by James III and James IV. He was lord high chancellor in 1488 and keeper of the privy seal in 1492. Later, he founded King's Coll. (1494), now part of the Univ. of Aberdeen, and was in part responsible for the introduction of the first printing press into Scotland (1507).

El Salvador (ɛl səl'vɑ-dór), See Salvador, Republic of El.

Elsheimer (ɛls-hɪ'mēr), ADAM, painter, born in Frankfort-on-the-Main, Germany, in 1578; died in Rome, Italy, in 1620. After studying in Germany, he settled in Rome, where he enjoyed the patronage of Church dignitaries. Regarded as one of the founders of modern landscape painting, he was the teacher of Pieter Lastman, who later taught Rembrandt. Elsheimer painted and etched mythological and Biblical subjects against natural landscapes and was especially interested in the depiction of light and shade—an interest that reached its zenith in Rembrandt and other Dutch painters. "The Good Samaritan" and "The Flight into Egypt" are two of his better-known works.

Elsinore (ɛl'si-nōr), the English name for HELSINGÖR, a city on the island of Zealand, Denmark, ca. 25 m. N. of Copenhagen. It is on the Sound (Öresund), opposite Helsingborg, Sweden, with which it is connected by railroad ferry. A port of strategic and commercial importance since the 13th century, it was ravaged by the Hanseatic League (1523) and by the Swedes (1658). A major port of entry for coal, Elsinore has shipyards and produces rubber and woolen manufactures. Overlooking the Sound is Kronborg Castle (built in 1574-85), famous as the setting for Shakespeare's tragedy "Hamlet." Population, 1945, 18,930; in 1960, 26,533.

Elssler (ɛls'lēr), FANNY, ballet dancer, born in Vienna, Austria, June 23, 1810; died there, Nov. 27, 1884. Trained for the ballet from her earliest years, she made her debut in Vienna before she was seven. Her sister, THÉRÈSE ELSSLER (1808-78), usually danced with her, but it was Fanny's skill and personal charm that won acclamation in Berlin, Vienna, Paris, London, and the U.S., where she toured in 1841. Ten years later she retired from the stage. Her energetic, fiery, and sensuous dancing made her a popular

performer in Europe as well as in the U.S.

Éluard (*ā-lū-ār'*), PAUL (pseud. of Eugène Grindel), poet, born near Paris, France, Dec. 14, 1895; died in Charenton-le-Pont, Nov. 18, 1952. Shortly after World War I, he joined with André Breton and Louis Aragon to develop the surrealist technique in poetry. In 1942 he and Aragon joined the French Communist party, becoming the leading poets of the Resistance. Éluard's style shows simplicity, freshness of thought, and rich rhythms. His works include "*Mourir de ne pas mourir*" (1924), "*La Vie immédiate*" (1932), and "*Poésie et vérité*" (1942).

Elul (*ē-lōl'*), the 12th month of the Jewish calendar, comprising 29 days, corresponding to portions of August and September in the Gregorian calendar.

Elvas (*āl'vāsh*), a city and commune of Portugal, in the province of Alto Alentejo, near the Spanish border and about 137 m. N.E. of Lisbon. Elvas has metallurgical industries and a 15th-century cathedral. The city was fortified by the Moors and was taken by Portugal in 1226. Population of the commune, 1940, 28,602; of the city, 12,413.

Elvehjem (*ēl-vā'ūm*), CONRAD ARNOLD, biochemist, born in McFarland, Wis., May 27, 1901; died in Madison, Aug. 3, 1962. After graduation from the Univ. of Wisconsin he became a member of the faculty (1930), full professor (1936), and dean of the graduate school (1946). His research in the components of the vitamin B complex (for which he won the Mead Johnson award in 1939) led to his discovery that niacin (nicotinic acid) will prevent or cure pellagra. He also discovered that copper is necessary for formation of hemoglobin. He won the Lasker award in 1952.

With Harry A. Waisman he wrote "The Vitamin Content of Meat" (1941).

Elves (*ēlvz*), a term applied to supernatural beings in the folklore of various countries. See *Fairies*.

Ely (*ē'lī*), a town in the Isle of Ely (*q.v.*), Cambridgeshire, England; on the Ouse River, ca. 15 m. N.E. of Cambridge and ca. 71 m. N.E. of London and connected to it by rail. Ely Cathedral, one of the largest churches in England, was founded by Ætheldreda, daughter of the King of East Anglia, ca. 673; it was burned by the Danes in 870. The present building was begun in 1083. Since additions were made through several centuries, the cathedral exhibits the various styles of British architecture. Ely was the last stronghold of the Saxons after the Norman Conquest (1066). Population, 1951, 9,898.

Ely, ISLE OF, an administrative county in northern Cambridgeshire, England. Its 374 sq. m., which consist largely of drained fenland, are devoted to agriculture, particularly fruits and root

crops. It is called "isle" because part of the area once stood, like an island, on higher ground. March (pop., ca. 12,000) is the county seat. Population, 1951, 89,038.

Ely, RICHARD THEODORE, political economist, born in Ripley, N.Y., April 13, 1854; died in Old Lyme, Conn., Oct. 4, 1943. After studying at Dartmouth and Columbia, he took (1880) his Ph.D. at Heidelberg, Germany. He was professor of political economy at Johns Hopkins Univ. (1885-92), at the Univ. of Wisconsin (1892-1925), and at Northwestern Univ. (1925-33). One of the most influential popular writers on economics, he co-authored (with R. H. Hess) "Outlines of Economics" (1889). Ely helped to found the American Economic Assn. and was its first president (1899-1901). He wrote "Socialism and Social Reform" (1894), "Monopolies and Trusts" (1900), and other books.

Elyria (*ē-lī'rī-ā*), county seat of Lorain County, Ohio, ca. 9 m. S. of Lake Erie, on the Black River, and ca. 23 m. S.W. of Cleveland, on the Baltimore & Ohio and the New York Central R.R.'s. It is surrounded by a rich agricultural country which produces grapes and other fruits and dairy items. The industries include automotive parts, bicycles, plastics, and toys. Elyria was settled in 1817 and is the seat of Gates Memorial Hospital for crippled children. Population, 1950, 30,307.

Elysée (*ā-lē-zā'*), PALAIS DE L', a palace in Paris, France, erected in 1718. The Marquise de Pompadour (1721-64) was among the tenants of the original building. Rebuilt in 1805, it was occupied by Napoleon Bonaparte, who signed his second abdication (1815) here. From 1871 on, it has been the home of the French presidents.



Courtesy Underwood & Underwood, N. Y.
PALAIS DE L'ÉLYSÉE

Elysium (*ē-līzh'i-ūm*) OF ELYSIAN FIELDS, in mythology, the place in which the souls of the good and of heroes favored by the gods were supposed to dwell after death. Most peoples considered this abode to be in the upper regions of the sky, but the Greeks located it in the west, somewhere at the edge of the world. Homer described it as the Isle of the Blessed, where men live without toil or care. Later poets, including Vergil, located Elysium in the underworld.

Elzevir (*ě'zē-vīr*), the name of a celebrated family of Dutch printers, famous for their editions of classical and historical works. Louis Elzevir founded the reputation of the family as printers in 1583, and he was succeeded by his seven sons. Abraham Elzevir (1681-1712), university printer of Leyden, was the last of these celebrated printers. The books issued are noted especially for the fine grade of paper and elegance of the types. They include 10 in Italian, 11 in German, 32 in Flemish, 44 in Greek, 126 in French, and 968 in Latin.

Em (*ēm*), in typography, the square of any given type face. The name originated from the amount of space required by the letter *m*. An *em* is half an *em*.

Emancipation (*ē-mān-sī-pā'shūn*), the liberation from bondage, applied in American history especially to the release of the Negroes from slavery. The early constitution framed in Vermont abolished slavery in 1777 and Massachusetts did likewise in 1780. Acts of gradual emancipation were passed by Pennsylvania in 1780, New Hampshire in 1783, Rhode Island in 1784, Connecticut in 1784, New Jersey in 1804, and New York in 1799, though in the last-mentioned state an act of absolute emancipation took effect July 4, 1827. Slavery was permitted in the remainder of the colonies, and in the case of new states the question was settled at the time of admission. Soon after the Civil War commenced President Lincoln was urged by Northern abolitionists to abolish slavery by proclamation. As early as 1862 laws were passed abolishing slavery in the territories, freeing escaped slaves of persons in rebellion, and abolishing slavery in the District of Columbia, the owners receiving compensation.

The Northern states entered upon the war to maintain the Union, not to liberate slaves. On Aug. 22, 1862, President Lincoln stated: "My paramount object is to save the Union, and not either to save or destroy slavery. If I could save the Union without freeing one slave I would do it; if I could save it by freeing all the slaves I would do it; and if I could save it by freeing some and leaving others alone I would do that." As the war progressed it became evident that slavery was a source of much military strength to the seceded states, and freeing them was decided on as a war measure. President Lincoln issued a proclamation on Sept. 22, 1862, in which the seceded states were notified that unless they returned to their allegiance by Jan. 1, 1863, he would declare their slaves forever free. Since the states in rebellion did not heed the notice, the Emancipation Proclamation followed on Jan. 1, 1863, by which all slaves in these states were declared free. It was given effect as rapidly as the Federal troops secured control of the territory held by the Confederates. In the proclamation the President de-

clared it an act of military necessity, enjoined the freed slaves to abstain from violence, and offered to engage them in the military and naval service. The Emancipation Proclamation was reinforced by the Thirteenth Amendment to the Constitution which forbids slavery. See *United States*.

Emanuel I (*ēm-ān'ū-ēl*), King of Portugal, called the Great, born May 3, 1469; died Dec. 13, 1521. He succeeded John II in 1495 and at once entered upon a vigorous reign, which became known as the golden age of Portugal. He prepared the code of laws that bears his name, under which education was extended and internal improvements were fostered, and Portugal was made the first naval power of Europe, as well as the commercial center of the world. It was in his reign that Vasco da Gama sailed round the Cape of Good Hope and made valuable discoveries in India, while Cabral was dispatched on the expedition in which he discovered Brazil, and Albuquerque and other noted navigators added valuable foreign territory. At the time of his death Portugal's colonies, military strength, commercial enterprise, and internal improvements were at their highest state of prosperity.

Embalming (*ēm-bām'ing*), the art of preserving the dead bodies of men and animals. There are many evidences that the art was practiced extensively in ancient Egypt, where the process was known at least 4,000 years B.C., this being evidenced by the embalmed bodies of Cheops and other sovereigns of the early dynasties. The origin of embalming is ascribed by the Egyptians to Anubis, who embalmed his father, Osiris. One of the earliest records of embalming is that of the patriarch, Jacob. We learn from reliable sources that the body of Joseph was thus prepared and transported out of Egypt. The practice prevailed, though not so extensively, among the nations of Asia and in Greece and Rome. Usually the bodies of the poorer classes were dried in the sand or washed in myrrh, and then salted for a period of 70 days.

Embalming among the middle classes consisted of removing the brain and soaking the corpse in a solution of natron, which destroyed the viscera and soft portions, leaving practically only the skin and bones. The wealthy frequently paid \$3,000 for the embalming of a single body, the process being nearly the same as among the middle classes, except that the corpses were swathed in linen bandages saturated with gum, and perfumed with aromatic substances. Within and about the bodies of different mummies have been found sulphate of soda, saltpeter, salt, soda, oil of cedar, turpentine, asphalt, myrrh, and cinnamon. Extended knowledge of the use and effect of chemicals has led to the employment of various compounds that are effective in artificial embalming, such as arsenic, sulphate of zinc, corrosive sub-

limate, and spirit compounds. They are forced into the blood vessels and cavities soon after death occurs, or the body is immersed for some time in spirits. At present, corpses are embalmed chiefly to prevent contagion, to make transportation less dangerous, and to overcome the necessity of immediate burial. See *Mummy*.

Embargo (*ēm-būr'gō*), a prohibition by government authority of the departure of ships or merchandise from some or all of its ports. It is either *hostile* or *pacific*: the former refers to the detention of vessels of a foreign country and the latter to detention of its own vessels. A hostile embargo is declared either as a means to settle a dispute or to make a reprisal, while a pacific embargo is laid as a public policy or to protect the merchant vessels of a neutral nation. The first general embargo was laid by the U.S. in 1794. It was effective upon all vessels for 60 days, and was laid as a retaliatory measure against the British orders in council dated June 8, 1793. One form of embargo restricts the shipments of a particular class of merchandise, such as military supplies, to warring nations.

Ember Days (*ēm'bēr*), certain days in each of the four seasons set apart for prayer and fasting, one theme for supplication being that the blessings of God may descend on the crops. They are the Wednesday, Friday, and Saturday after the first Sunday in Lent, after Whitsunday, after the 14th of September, and after the 13th of December.

Embezzlement (*ēm-bēz'z'l-mēnt*), the misappropriation of property entrusted to one's care, a statutory offense in both the U.S. and England.

Embolism (*ēm'bō-lizm*), in medicine, any obstruction of a blood vessel, especially of an artery, by coagulated blood fibrin, or by bacteria or fragments of blood vessels. Such clots are sometimes transported by the blood stream to the heart. If the right side or pulmonary artery (*q.v.*) is blocked there, the patient's circulation stops and he dies. Partial blocking may cause pneumonia.

Embolus (*ēm'bō-lūs*), in medicine, a piece of a thrombus (*q.v.*) broken off from its source of origin such as in a vein in the leg. See *Heparin*; *Thrombosis*.

Embossing (*ēm-bōs'ing*), the art of producing raised figures upon plain surfaces, such as paper, leather, bronze, and wood. In bronze and wood the figures are said to be in *alto*-, *mezzo*-, or *bas-relief*, according to whether they are more or less prominent. Paper, leather, textiles are embossed by presses, in which the dies give their pattern to the object embossed. Steam keeps the plate at a suitable temperature, and the power is applied by a treadle to straighten a bent arm, as in the old form of the printing press. Wood to be embossed is softened by steam and the impressions are made by iron molds into which it is forced.

Metal is embossed largely by hand, the workman beating it up from the under side; this method is called *repoussé* work. Embossing of textile fabrics is done largely as needlework embroidered over figures padded with various materials, such as wool felt.

Embroidery (*ēm-broid'ēr-y*), the name applied to ornamental needlework produced upon fabrics of any kind. Its production was one of the most important of the early arts in Oriental countries, and it is still practiced with much skill and diligence, the best work being done upon silk. The figures are either in colored silk or in threads of silver and gold. They consist of men, horses, dragons, etc., and are outlined with gold or black and filled with shades of silk; sometimes they are ornamented with beads, spangles, pearls, and precious stones. The fabric is stretched, usually on a frame, with the design to be worked drawn upon it, or some other contrivance is used to guide the worker.

From the earliest times embroidery has been used to decorate sacerdotal vestments, but it has likewise served other ecclesiastical uses. In modern times it has been employed to a large extent in women's dresses and undergarments. The Jews derived their skill in producing embroidery from the Egyptians. It appears to have been a common



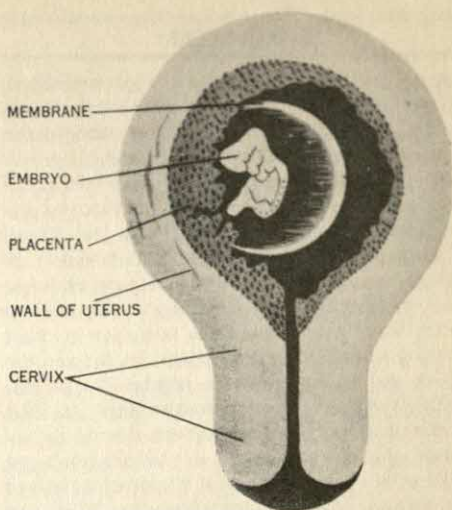
LINEN EMBROIDERY, ABOUT 1300

EMBRYOLOGY

art, since even barbarous tribes were skilled in making showy designs upon cloth and other fabrics, using both linen and wool for the purpose. Many of the nomadic tribes of Asia and Africa still practice it as a domestic art. The process of doing embroidery work, even in modern times, employs simple tools and the work is largely by hand. The tools consist chiefly of needles of different sizes and scissors to cut the thread. The thread left on the surface of the cloth after each ply of the needle is called a *stitch*. The stitches differ according to the work to be done and include principally those known as the cross, darning, running, crewel, feather, rope cushion, buttonhole, chain, canvas, and couching stitches. Various machines for making embroidery are now in use.

Embryology (*ēm-brī-ōl'ô-gĭ*), that branch of biology which treats of the formation of organisms. The study of this division of learning as a science dates from the last century though Aristotle, Galen, and Harvey considered the subject and laid the foundation for modern embryologists. The epoch of life in placental mammals (*placenta* means afterbirth, *q.v.* under *Birth*), to which the study of embryology ordinarily is limited, extends from the time of conception to the period at which the anatomical connection between the young and mother is severed, though in a general sense it embraces the entire period from conception to the attainment of the perfect form. By *conception* is meant the *fertilization* (*q.v.*) of the ovum, which takes place when a spermatozoon, or male germ cell, penetrates it, both in animals and plants. However, there are radical distinctions that give rise to divers limitations.

In most fishes and some other animals the embryo and parent have no anatomical connection, while fertilization of the ovum in many of these is effected outside the female. In oviparous animals the female retains the ovum within the body for some time after fecundation; it is retained in a condition largely independent of the maternal body, though securing from that body both heat and protection. After a definite number of eggs have been ejected, the mother begins ex-

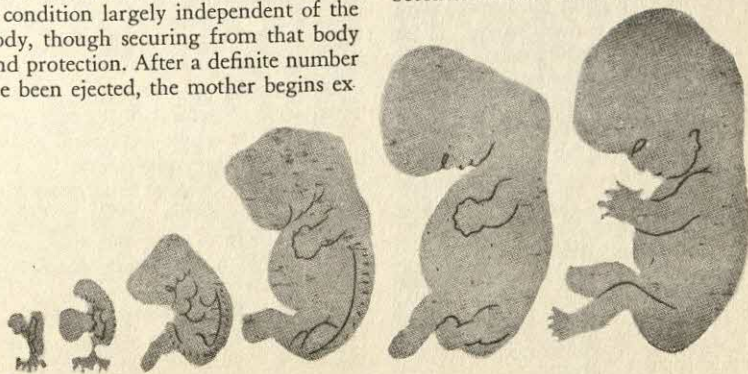


PREGNANT UTERUS (WOMB)

Within a short time, the one-cell fertilized egg has divided and redivided until it has become a mass of millions of cells forming the embryo

ternal incubation, which is continued until the young life bursts from the shell. However, a filial relationship exists after incubation by which the new life is supplied with protection and food, while in other animals the lacteal (*i.e.*, nursing or suckling) function of the mother supplies the helpless young with support quite as vital as the nourishment previously extended through the placenta.

The laws announced by Rudolf Virchow (*q.v.*) and Karl Ernst von Baer (1792-1876), two German scholars, form the basis of study in modern embryology. The laws expressed by Virchow (1821-1902) imply that the organs of new life forms originate primarily from cells deposited in the ovulum and gradually become complex through cell division and cell specialization, or the physiological division of labor. Von Baer's law maintains that the form primarily assumed by an individual in the process of development is similar to that assumed by many types; later its organism becomes more specialized and, when fully devel-



ACTUAL SIZE

THREE-QUARTER SIZE

DEVELOPMENT OF THE EMBRYO FROM ABOUT TWO WEEKS TO ABOUT TWO MONTHS

oped, stands wholly apart from parallel types. Thus, the process of development leads to the special from the general, to the heterogeneous from the homogeneous.

E. F. G. Herbst explains the whole process of embryonic development by asserting that the protoplasm is almost infinitely versatile and susceptible of almost infinite specialization; that it responds in a very intricate way to its surroundings; that it depends upon physiological responses to stimulations that come from without; in other words, that the cells and organs in the embryo move and change form in response to various stimuli, especially in eggs containing a considerable quantity of yolk. It has been shown, for example, that the pricking of a fertilized frog's egg with a fine needle may cause the development of monstrous forms of tadpoles—e.g., with two heads or two tails. As the yolk is food for the embryo, and the latter gives off waste products in the process of rapid growth, it moves from one portion of the yolk to others, to avoid the contamination of the yolk by such wastes.

It is quite well known that the development of the embryo differs materially in different animals, though in the successive stages there is much analogy, even in the human fetus (*q.v.*), to the embryo or adult of the lower life forms. The human fetus, e.g., in early stages (see illustration) has gill clefts similar to the gills of adult fishes. (See also *Evolution*.) In this connection arises the discussion of the theories of *evolution* and *epigenesis*. According to the former theory, the embryo exists preformed in the ovum and begins to unfold into the adult as soon as fecundation takes place; while in the latter we find the theory that holds the growth of the embryo to be a process of new formation, the cell mass giving birth to new cells in its own interior by stimulation from without, a view now most generally accepted.

Microscopic studies of serial sections of embryos of various stages show that the finally differentiated parts and organs arise from three primary types of tissue, or germ cell layers, called the *ectoderm*, *mesoderm*, and *endoderm*. These layers originally develop by dedifferentiation from the early many-celled stage of the fertilized ovum. From the ectoderm are developed the skin, nails, hair, eyes, ears, external genitalia, etc. From the mesoderm arise the muscles, heart, blood vessels, urinary tract, and internal reproductive organs. The endoderm produces the digestive tract and associated organs—all three layers being finally blended into the total organism.

Sex is determined by the chance union of like or unlike sex chromosomes (*q.v.*) and heredity (*q.v.*) from the primary union of sperm and ovum. The so-called x-chromosome of the ovum, if combined with the x-chromosome of the sperm, results in a female. If, however, the male or y-

chromosome of the sperm unites with the x-chromosome of the ovum, a male is produced. See also *Birth*.

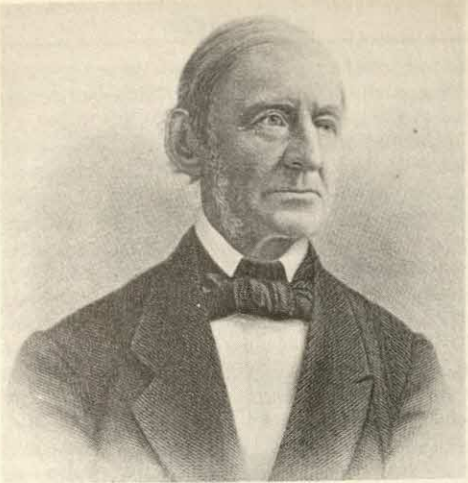
Emden (*em'den*), a city in northwestern Germany, on an arm of the Dollart estuary of the Ems River. The city is intersected by numerous waterways, crossed by bridges, and stands at the mouth of the Ems-Jade canal. There is a 16th-century town hall which houses a library and a collection of arms. Shipbuilding is an important activity. The herring industry is extensive. Emden's history goes back to the 10th century; in 1433, it came under the rule of Hamburg; in 1595 it became a free city; in 1751 it became a free port. It passed to Holland in 1806; in 1815 it became part of Hanover, which was itself taken over by Prussia in 1866. In World War II, Emden was the target of the first American air raid on Germany (1943), and thereafter was bombed heavily. After the war, it was occupied by British forces. Population, *ca.* 30,000.

Two German Navy cruisers were named for the city. The first gained notoriety in World War I for inflicting considerable damage on British ships.

Emerald (*em'er-ald*), a variety of beryl, distinguished by a rich green color, in place of pale green, light blue, yellow, or white hues, which are the colors of the beryl. The emerald green of this gem is produced by the presence of chromium. Jewelers obtain the finest emeralds from Peru, but fine species are found in other places of South America, and an inferior quality is native to Europe. The emerald is usually in the form of a prism, and is most valuable when the surface is perfectly straight and smooth, so as to cast no darkening shadow on any of its particles. It is one of the softest of the precious stones, but acids will not affect it. Emeralds are cut on a copper wheel with emery dust, and polished on a tin wheel with rottenstone. See also color plate, *Precious Stones*, in volume IX.

Emerald Isle (*il*), the popular name of Ireland, applied to it on account of the rich green color of its vegetation. It came into general use through Dr. Drennan (1754-1820), who first used it in his poem entitled "Erin."

Emergency (*em'ur-jen'si*), STATE OF, a national crisis of natural or political origin, calling for immediate action. In natural catastrophes, relief measures are undertaken by such Federal agencies as the Office of Emergency Planning (see *Defense Mobilization, Office of Civil and*), and by the American National Red Cross. During severe economic depression, agencies may be established for the duration, such as the Federal Emergency Relief Admin. (1933-38). Political crises may include such occurrences as that in 1950, when President Harry S. Truman declared a state of emergency because of Communist aggression in Korea (*q.v.*). In case of threatened



RALPH WALDO EMERSON

invasion or widespread domestic violence, martial law may be declared, putting government temporarily under military control.

Emeritus (*ê-mêr'i-tûs*), Latin, meaning having earned discharge, term used to designate a professional who has retired from active service, such as a retired university or college professor, or a retired clergyman.

Emerson (*êm'er-sun*), RALPH WALDO, essayist, philosopher, and poet, born in Boston, Mass., May 25, 1803; died Apr. 27, 1882. He was descended from a long line of New England ministers. He attended the Boston Latin School and was graduated from Harvard Coll. in 1821. After a few years of teaching, he studied theology under the direction of William E. Channing (*q.v.*), and was installed as associate minister of the Second Unitarian Church in Boston (1829). Although he soon gave up this charge because his views on the Lord's Supper differed from those of his congregation, he continued to preach in various places until about 1847. In 1829, he married Ellen Louisa Tucker and after her death three years later spent some time in Europe. While in England, he became acquainted with Wordsworth, Coleridge, Landor, and Carlyle, and he maintained a long friendship with Carlyle. In 1835, he married Lydia Jackson and settled permanently in Concord, Mass., leaving his home only to make lecture tours and to take trips to Europe.

The life of Emerson was essentially that of a literary recluse since he gave most of his time to study and research. He took considerable interest in public questions, but his knowledge of the practical affairs of public life was comparatively limited. The fact that Emerson was essentially a lecturer and not a writer shows very clearly in his works. He is a typical representative of Unitarian beliefs and Victorian Romanticism. This fact explains his tremendous influence on contemporary American and to a certain degree even

English thought. His point of view was a completely idealistic one, but it was a romantic idealism which simply neglected certain facts of life. For example, although he held democratic convictions, he was practically an intellectual aristocrat and disliked the "crowd." He even evaluated works of art according to their fundamental moral and educational value, appreciating a painting, a poem, even the beauties of nature, less for themselves than for the effect they could and would have upon man.

He was admired by his contemporaries, who not only thronged to his lectures in Boston but made pilgrimages to his home in Concord which had already become a spiritual center through the sojourn there of men like Nathaniel Hawthorne (*q.v.*), and Amos Bronson Alcott (*q.v.*). Gradually, Concord became through him the center of the New England spiritual movement, or as it was called, Transcendentalism (*q.v.*)

It was characteristic of Emerson that among the various tendencies amalgamated in Transcendentalism, he emphasized its practical and humane trends especially. His interest in abolition (*q.v.*) is an example of this, and a lecture he held on this subject gave him the opportunity of meeting Lincoln (*q.v.*). The very vagueness of the transcendentalistic movement, which included so many elements of German idealism, made Emerson attempt to transform it into a stimulus for social-ethical behavior. He did not, however, participate in the attempts at socialistic-communistic reform toward which the transcendentalist movement led some of its adherents.

The transcendentalist movement had its own organ, the *Dial*, for which Emerson wrote many articles and of which he later became the editor (1840-44). His most important work was the collection of his essays, "Conduct of Life," which appeared in 1860. The educational tendencies of these essays were the result of ideas which originated from his study of Greek and German philosophy. Here, as in his earlier work, "Nature," published in 1844, Emerson emphasized the primary intellectual and spiritual character of the world—of which nature, in his concept, represented only a symbol. These essays made him in the eyes of his contemporaries a spiritual leader, whose moral courage and self-reliance were considered an example of dignified life.

In 1867 appeared a collection of Emerson's poems, entitled "May Day, and Other Pieces," which had already been published separately in various periodicals. This work shows clearly how Emerson, as he grew older, confined himself more to efforts to improve the ethical attitude of man, and the less he became interested in metaphysical abstractions. Emerson considered himself a poet, but the beautiful thoughts expressed in his poems interest us more than their form. The intel-

lectual element is always stronger than the emotional.

Thus it is more the edifying preacher than the imaginative writer that we admire in Emerson today. Although from a merely artistic point of view, his contemporaries, Whitman and Edgar Allan Poe, were greater artists, the influence of Emerson has always been and still is greater than theirs. It is the integration of the feeling for beauty with moral reflections which makes him typical of the sentiment of New England.

The complete collection of Emerson's works includes philosophical and religious writings, poems, essays, and lectures. Other well known works not mentioned above are: "Essays" (1841, 1844), "Representative Men" (1850), "The American Scholar" (1837), "Nature: An Essay" (1836), "Society in Solitude" (1870), "English Traits" (1856), and the posthumously published "Letters to Thomas Carlyle."

Emery (*ēm'ēr-y*), a variety of corundum, allied to the sapphires, the ruby, and other precious stones. It is granular in texture and the hardest substance found native, next to the diamond. Emery is a dense, opaque, dull grayish-black substance, occurring in boulderlike masses and as granulates in soils. It is found in the islands of the Greek Archipelago, in Asia Minor, at Chester, Mass., and elsewhere. As a powder it is used extensively for cutting and polishing precious stones and for smoothing the surfaces of lenses and plate glass. When employed in this form, it is prepared by first breaking the stone into small lumps, then crushing them into powder by stampers. Emery paper and emery cloth are made by sifting the powder over strong sheets of paper or cloth which have been brushed with liquid glue. Emery wheels are commonly made of wood covered with leather or coarse cloth, with a sur-

face of emery, or a compound of emery and rubber molded into the shape of a grindstone and vulcanized.

Emigration (*ēm-i-grā'shūn*), the removal of residence from one country or region to another. Inhabitants leaving a country are called emigrants, while those coming into a country or state are spoken of as immigrants. Among the principal causes that have led to emigration are overpopulation, political and social discontent, compulsory military service, religious and political persecution, the desire to attain greater liberty or better industrial conditions. The barbaric tribes of ancient times were induced to migrate and occupy territory more conducive to their arts of warfare and life, while civilized people have migrated more or less for other purposes, frequently to carry the benefits of civilization and religion to remote lands. See also *Immigration*.

Europe was settled by the overpopulation that pressed westward from Asia, and later, when the population of European countries became dense, the inhabitants in turn sought newer lands and greater opportunities. The fact that people are governed by certain laws of migration, such as passing to countries having a similar climate, the same natural resources, and an approximately equal altitude, has been well established.

Emigration to America on a large scale began with the departure of the Puritans, who planted colonies in New England. Soon after the Dutch colonized New York, the Germans settled Pennsylvania, the French occupied Canada and Louisiana, the Spaniards made settlements in Florida, and the Swedes established a foothold in Delaware. In 1815 such an extensive breaking-up occurred in Europe that alarm was occasioned, though afterward it became manifest that the emigrants were made up largely of the

IRISH EMIGRANTS PAYING FOR THEIR PASSAGE TO AMERICA, 1851

Courtesy Brown Bros., N. Y.



overpopulation of various countries. The last century marks the greatest epoch of migration in the world's history, a period in which the Spanish and Portuguese languages were planted in Central and South America, the English in North America and Australia, and the Dutch, English, German, and French in various portions of Africa, Asia, and the Oceanic islands. Perhaps the planting of language is even overshadowed by the establishment of certain forms of religion, industries, and customs, and the molding of a new civilization. The colonial policy pursued in recent years by the great powers of Europe tended to direct the overpopulation to various colonies, and thereby to strengthen more and more the foothold of these nations in regions far remote from the mother country. This is particularly true of the Russians in Asia, and the Portuguese, French, Belgians, English, and Italians in Africa. During World War II there was a great emigration of political and religious refugees from Nazi-dominated countries chiefly to the British Empire, the U.S., and some Latin American countries. However, emigration has become more and more difficult in recent years due to quota limitations, etc., in a number of countries.

Émigrés (*â-mê-grâ'*), the name given to the royalists who fled for safety from France during the Revolution of 1789. The movement began shortly after the storming of the Bastille on July 14, 1789, when Prince Condé became alarmed at the course of events and was joined by many nobles in emigrating to Germany and the Netherlands. In October of the same year a concerted attack was made on Versailles, causing the royal family to remove to Paris, and this was followed by a renewal of emigration on a larger scale. The *émigrés* collected an army of 80,000 men at Coblenz under the Duke of Brunswick and the king made a disastrous attempt to join the forces, but was captured on the night of June 20, 1791. Condé and his adherents joined the Prussian army in Champagne, which caused the French government to confiscate their property and to proclaim the death penalty upon many for treason. When Napoleon gained the consulship, they were permitted to return, but the charter of 1814 made it impossible for them to regain their estates or former privileges. In 1825 the government voted to compensate them for the loss of their estates, but this was annulled as a result of the Revolution of that year.

Eminent Domain (*êm'i-nent dô-mân'*), the supreme right possessed by a country or state to take or control private property for public use without the consent of the owner. This right is justified in all civilized nations because it serves to promote the general welfare. It is not a confiscation of the property, since it is required that full and adequate compensation be made to the

owner; it is to a large extent the outgrowth of the feudal system of land tenure in England and elsewhere. The Parliament of Great Britain provides for reasonable compensation to the owner of property taken for public use, but this is done rather as an act of justice than because of legal obligation. In the U.S. it is a constitutional requirement that no person shall be deprived of property without due process of law, and "private property shall not be taken for public use without just compensation." Nearly all of the states have similar constitutional provisions, and under them, or the statute laws, property may be taken for public use in the same way as it may be taken by the national government. The right of eminent domain is essential and necessary, since otherwise it might become impossible to construct public buildings, highways, canals, and railroads.

Emin Pasha (*â-mên pâ-shâ'*), African traveler, whose real name was Eduard Schnitzer, born at Oppeln, Germany, in 1840; slain Oct. 20, 1892. He was educated at Neisse, studied medicine in Berlin, and went to Turkey in 1864, where he became successful as a physician. After learning Arabic and Turkish, he adopted Turkish habits and customs, and assumed the name of Emin, meaning the "Faithful One." Later he accompanied Hakkî Pasha on official expeditions through Armenia, Syria, and Arabia, became attached to Ismail, governor of Scutari, and, after the death of the latter, married his widow. He joined the Egyptian service as chief physician in 1876, and two years later was appointed governor of a province by Gen. Gordon. Soon after, the troops of the Mahdî cut off his means of communication and surrounded his forces, though he defended himself until an expedition under Stanley came to his relief in the spring of 1888. The following year he was taken prisoner by the natives, but escaped and entered the German service. In 1892 he undertook an expedition to the Congo, where he was captured and murdered. Many European countries bestowed distinguished honors upon him for service in African research.

Emmanuel (*ê-mân'û-êl'*), or IMMANUEL, Hebrew meaning God with us, symbolic name applied in the Old Testament to the Messiah whose birth the prophet Isaiah (7:14) foretells. In the New Testament (Matthew 1:23) the name is applied specifically to Jesus.

Emmaus (*êm-â'ûs*), name of a small village, some miles from Jerusalem, referred to in the New Testament (Luke 24:13). It was in Emmaus that Christ is said to have appeared to two disciples after his Resurrection, a scene frequently depicted in painting and the graphic arts. Especially famous are the various interpretations which Rembrandt (*q.v.*) gave to this scene. The apparition of the Lord at Emmaus has also been portrayed by Albrecht Dürer and Rubens. The actual



Courtesy Rosenwald Collection, National Gallery of Art, Wash., D. C.

CHRIST AT EMMAUS

Etching by Rembrandt van Rijn (1606-1669)

geographical location of Emmaus is unknown although it has often been identified with the modern Amwas.

Emmet (*ēm'ēt*), ROBERT, Irish patriot, born in Dublin, Ireland, in 1778; executed Sept. 20, 1803. At the age of 15 he entered Trinity Coll., Dublin, where he was a fellow of Thomas Moore, the poet. He was expelled in 1798 for joining the Association of United Irishmen. Soon after, he traveled in Europe, consulted with Talleyrand and Napoleon regarding the Irish cause, and planned a general revolution, devoting his own fortune of \$15,000 for the purchase of munitions of war. He attempted to seize the arsenal and castle of Dublin on July 23, 1803, but the attempt failed, his men dispersing after the first volley had been fired. He escaped in safety to the Wicklow Mts., but, contrary to the advice of his friends, he insisted on visiting Sarah Curran, daughter of the celebrated barrister, and was apprehended. The speech he made in his own behalf at the trial on the charge of high treason was remarkable for its eloquence, but he was convicted and hanged. Thomas Moore commemorated his fate by writing, "O, Breathe Not His Name," while he perpetuated the memory of Miss Curran, who died in Sicily soon after Emmet's execution, by writing, "She Is Far From the Land Where Her Young Hero Sleeps."

Emmett (*ēm'ēt*), DANIEL DECATUR, musician

and author, born in Mt. Vernon, O., Oct. 29, 1815; died June 29, 1904. He was descended from a family which is prominent in the record of American wars. In 1859 he composed the celebrated song, "Dixie Land," which, during the Civil War, attained a popularity among the Confederates equaled only by "John Brown's Body" among the Northern soldiers. This famous air is as popular now as when it was written, and touches the emotions in foreign lands quite as effectually as on the American continent. Other publications include: "The Road to Richmond," "Old Dan Tucker," and "Walk Along, John."

Emotions (*ē-mō'shūnz*). See *Psychology*; *Psychiatry*.

Empathy (*ēm'path-ŷ*), a philosophical term which refers essentially to the involuntary identification of one's self with an external object and one's projection into that object. The ability to project one's self into a foreign subject is of great importance in esthetic enjoyment. The founder of the theory was the German philosopher, Theodore Lipps, who called it "Einfühlung." He believed, for example, that by looking at the form of a Greek column one is able to feel one's self standing like the column and bearing the weight of the architrave. Similarly, when one enjoys a statue, one involuntarily projects one's self into that statue in an identical position. On the lowest level, the love adventures in a film give us esthetic enjoyment since empathy causes us to identify ourselves with the hero of the film. This theory is widely applied in modern psychology, for example, in fashion advertising.

Empedocles (*ēm-pēd'ō-klēz*), Greek philosopher, born at Agrigento, Sicily, flourished about 435 B.C. He was descended from a distinguished family and is regarded as a great poet and public benefactor. According to his theory the world is compounded of four primary elements; that is, air, fire, earth, and water. He thought that there are two forces, hate and love, which he considered repulsive and attractive. His chief work, entitled "Nature," is a poetic treatment of cosmology and psychology. It is related that he threw himself into the crater of Mt. Aetna to become immortal.

Emperor (*ēm'pēr-ēr*), the title of a sovereign who rules over an empire, considered superior to the rank of king. It derives from the Latin word *imperator* (commander), a title conferred by the ancient Romans on consuls in their military capacity. In 29 B.C. the Roman senate so honored Octavianus, during whose time Rome became an empire (see *Augustus*). Charlemagne (*q.v.*), who virtually founded the Holy Roman Empire (*q.v.*) in 800, established a reign of emperors which, at least on paper, lasted until 1806. Currently, the rulers of Ethiopia and Japan have the title of emperor.

EMPEROR JONES

Emperor Jones (*ēm'pēr-ēr gōnz*), THE, a play by Eugene O'Neill (*q.v.*), first presented in 1920. The story concerns a civilized Negro who becomes emperor of a primitive tribe, but is eventually defeated by his own ambitions. Hunted through the jungles, he turns savage himself. In 1933 Louis Gruenberg, a Russian-American composer, wrote an opera based on O'Neill's play, and it was performed at the Metropolitan Opera House, New York, the same year.

Empire Day (*ēm'pīr dā*), in the British Commonwealth, May 24, Queen Victoria's birthday, set aside as a holiday. The rallying cry is "For God; For Duty; For Empire."

Empire State Building (*ēm'pīr stāt bīl'-dīng*), the world's tallest building, located in New York City, on the west side of Fifth Avenue, and covering the block between 33rd and

THE EMPIRE STATE BUILDING

Empire State, Inc.



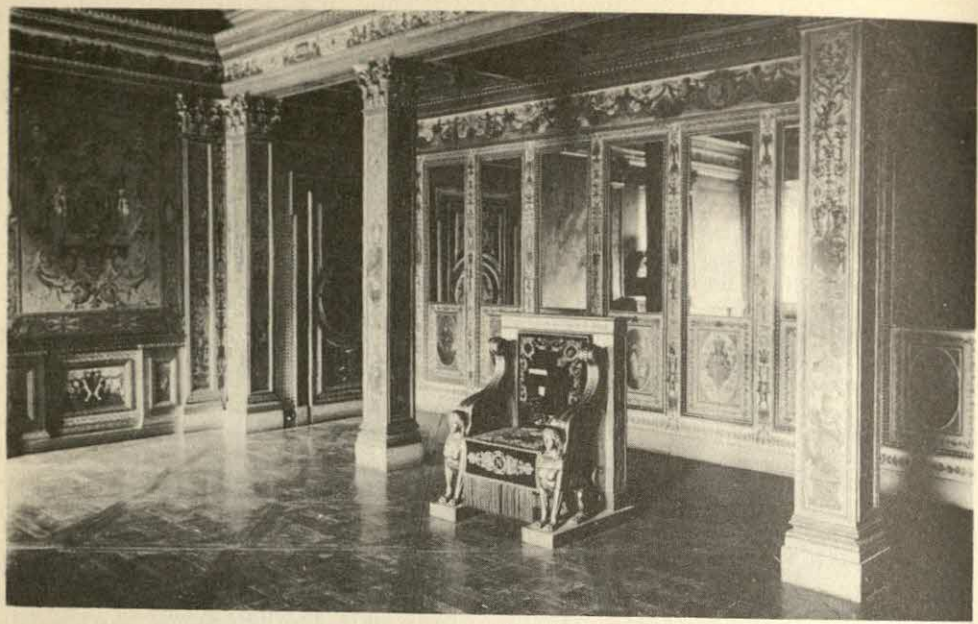
Empire State, Inc.

VIDEO TOWER ATOP EMPIRE STATE BUILDING

A multiple television tower, added to the world's tallest structure in 1951, increased the building's height by 222 ft. The operation of the tower marked the first commercial use of transmission of more than one signal from a single pole.

34th Streets. Built 1930-31 on the site of the old Waldorf-Astoria Hotel, it has exterior cover work executed in Indiana limestone and granite, supported by a steel framework for which 60,000 tons of metal were used. One hundred and two stories above the street (and with two more below the street level), it has a height of 1,472 ft. The upper tower contains observatories and television antennas.

Empire Style (*ēm'pīr stīl*), a term used in the history of art and decoration to characterize all products of applied art (such as china, glass, and carpets, but especially furniture and whole interiors) which originated at the time of Napoleon's rule as emperor (1804-15). The Empire style spread from France throughout the whole of Europe and even to the U.S. It is characterized by a rather strange mixture of revived Roman forms and Egyptian influence, the latter stimulated by the Egyptian expedition of Napoleon. The wood generally used in furniture was mahogany with bronze handles and applications. The correspond-



Courtesy French Press & Information Service, N. Y.

EMPIRE STYLE

Napoleon's armchair. Luxembourg Palace, Paris

ing style in painting and sculpture, as well as in architecture, is called *Neo-Classicism* (*q.v.*). The Empire style in architecture, the figurative arts, and the applied arts died out in Europe after 1830 and after 1850 in the U.S., where it was called "Classical Revival."

Empiricism (*ēm-pīr'i-çizm*), a theory in philosophy which regards experience as the only source of human knowledge. According to this theory experience is derived from individual sense impressions automatically recorded on the mind which is originally a blank. These impressions, especially when they form a pattern, are translated into experience, or knowledge. The mind may develop theories or have intuitions, but they do not increase man's knowledge. Consequently, no universal truths exist *a priori*; no innate ideas exist, or, if they do exist, they do not help us to recognize truth. There are no presuppositions, no absolute assumptions on which we can base our knowledge. Every law of nature or science is reducible to the content of experiences, and, logically, our knowledge is limited because no knowledge exists without direct acquaintance with sense-given fact. All metaphysics is, therefore, excluded. According to the empiricists, the statement of a law is based on a series of recurrent experiences, and it cannot be proved absolutely. The concept of necessary connection, or cause and effect, is purely a product of the mind. The "natural law" asserts that certain consequences and consistencies have been "observed." Hence, the law becomes merely a statement of

probability.

According to empirical logic, moral laws obviously do not exist, nor do any general laws concerning government and social relations. No higher revelation or personal intuition can guide us to truth. Moral laws are rules of behavior which are based on a series of observed experiences and are imposed on society for the sake of convenience.

In the history of philosophy we find representatives of the empirical point of view even among the early Greek philosophers. Later on, it was revived by men such as Francis Bacon and Descartes. Hobbes, and especially Hume, were the leaders of the new movement of empiricism. John Stuart Mill, Bentham, and others of the associationalist school were chiefly responsible for the development of an empirical system or variations of such a system. Among the most important contemporary representatives of empiricism are William James (radical empiricism) and John Dewey (immediate empiricism).

Employers' Liability (*ēm-ploi'ērz lī-a-bil'i-tī*), legal term, designating the liability and responsibility of the employer for injuries of the workmen employed by him. The term is especially used with reference to a series of statutes, enacted in England since 1880 and later on in some parts of the U.S. Generally, these statutes entitle the employee to recover sustained damages from his employer if negligence has caused the accident. The Liability Act of England, 1880, and the Workmen's Compensation Acts (*q.v.*) of

1897 and 1900 created the model for the respective acts by American states. Today, generally, the employer is insured for his risk. See *Workmen's Compensation*.

Employment Service (*ēm-ploĩment sār-vīs*), UNITED STATES, a government agency established to help place workers throughout the country. The first such Federal agency was the division of information (created 1907) within the Bureau of Immigration and Naturalization, Department of Labor. Employment service was established as unit within the Labor Department in 1918. In 1933, it was organized as a bureau to supervise the state employment agencies, which were partially subsidized by the Federal government. Its functions were consolidated with the unemployment compensation functions of the Social Security Board in 1939, and transferred to the Federal Security Agency. Early in 1942 the state agencies were combined into the U.S. Employment Service, and placed under the jurisdiction of the War Manpower Commission. During World War II, the U.S.E.S. worked to fill the labor needs of war factories. A priority system was established, and workers in many essential industries were required to secure clearance of the U.S.E.S. to change jobs. After the war, the War Manpower Commission was discontinued (September 1945) and the U.S.E.S. was returned to the Department of Labor. In 1946 the national employment service was returned to its pre-war system of state agencies under Federal subsidy, retaining a supervisory capacity.

Emporia (*ēm-pōĩ-ri-ā*), county seat of Lyon County, Kansas, on the Neosho River, 120 m. s.w. of Kansas City. It is on the Kansas City Southern and the Atchison, Topeka & Santa Fe R.R.'s. The surrounding country is a fertile farming region. Among the chief buildings are the county courthouse, the Carnegie library, a conservatory of music, the Coll. of Emporia, a Presbyterian institution. It is the seat of a State Teachers Coll., and was the home of William Allen White (*q.v.*), American author, proprietor and editor of the *Emporia Gazette*. The manufactures include clothing, ironware, machinery, flour, dairy products, and works in marble. Emporia was settled in 1856 and incorporated in 1870. Population, 1930, 14,067; in 1940, 13,188; in 1950, 15,669.

Empyema (*ēm-pĩ-ē-mā*), in medicine, pus gathered in a cavity, especially in the pleural cavity. The term is also applied to collections of pus such as in the frontal sinus, in the accessory cavities of the nose, etc.

Emphyrean (*ēm-pĩ-rē-an*), in ancient metaphysical philosophy, a term designating the highest sphere in which the purest elements of life exist.

Ems (*āms*), usually called the Bath of Ems, a bathing place of Germany, about 4 m. from

Coblentz, on the Lahn River, in the province of Hesse-Nassau. The thermal springs belong to the class which contain soda, have a temperature of 78° to 125°, and the waters are used both for drinking and bathing. The value of the springs was known to the Romans. After World War II it was placed in the French occupation zone. Population, ca. 7,500.

Emu (*ē-mū*), of EMEU, a large bird closely allied to the cassowary, standing from 5 to 6 ft. high. It is native to Australia and the adjacent islands. The color is a dull brown mottled with gray-white, but the young are striped with black. The head is devoid of a helmet, as found in the cassowary, and the bill is depressed. Australian natives value the flesh and eggs for food, the former having a taste which resembles that of beef. Emus are easily domesticated and breed readily in that state. The eggs are not as large as those of the ostrich, being only about 4 in. in diameter, but require three months for incubation, which is



Courtesy Australian News & Information Bureau, N. Y.

EMU AND CHICKS

sometimes performed by the male. They live on roots, fruits, and herbage. The only sound uttered is a loud, booming cry made by the female. This species of birds is unable to fly, but it possesses much speed in running. See illustration.

Emulsion (*ē-mūl'shūn*), a medical preparation composed of a soft liquid resembling milk in consistency and color, its oily or resinous property being united with water by a saccharine or mucilaginous substance. Among the best known is the emulsion of cod-liver oil, used in treating pulmonary disease.

Enamel (*ĕn-ām'ĕl*), the name given to vitrified substances of various composition, applied to the surface of metals. It is generally put on like paint, with a brush, and then heated sufficiently to melt the enamel, which causes it to become a fixed part of the surface. The art was practiced by the Egyptians and Etruscans on pottery, and passed from them to the Greeks and Romans. In Western Europe, especially among the Saxons and Normans, it was early employed in manufactures. When used for producing artistic designs, figures, and ornaments, it is considered as the fine arts; it is also employed in making the dial plates of watches and clocks and for coating culinary vessels. The basis of all enamels must be an easily fusible, colorless silicate or glass. All bases on which it is applied must be cleaned with weak acid, or some similar preparation, and moistened with gum water. Copper is the best base, but iron is used for ordinary purposes.

Enarea (*ā-nā'rĕ-ā*), a region of Africa, in the southern part of Abyssinia, between 7° and 9° N. lat. It is inhabited by natives of the Gallas tribes. The government is hereditary and absolute. Among the chief products are coffee, cloth, embroidery, gold, livestock, and fruits. In religion the people are largely Mohammedans. The slave trade is still sanctioned, though it has been abridged greatly in recent years. The government is administered from Saka, a city near the Gibbe River. Population, ca. 42,500.

Encaustic Painting (*ĕn-kas'tik*), the method of fixing colors upon objects by the process of burning. The ancient Greeks employed the encaustic art in decorating the inner and outer walls of buildings and in ornamenting sculptures in marble. It was a common kind of painting among the artists of Rome during the empire. The colors were mixed with wax and resin, and the pictures were finished by the application of a hot iron, hence it gave the product a more glossy surface than that obtained in water-color painting. It has the advantage of being very enduring, hence the art has been revived to some extent. Polygnotus' "The Battle of Marathon" is a good example of encaustic painting and was preserved in an open portico at Athens about 10 centuries.

Encephalitis Lethargica (*ĕn-sĕf-ā-lĕ'tĭs lĕ-thār'jĕ-kā*), in medicine, an epidemic disease which is probably contagious but whose actual cause is not yet known. A filterable virus is held to be the most probable. The acute form usually occurs with influenza; symptoms of the disease are high fever, drowsiness, and muscular pains. The drowsiness is sometimes followed by somnolence and lethargy. Hence the name of "sleeping sickness" is frequently wrongly applied to this disease.

Encyclical Letters (*ĕn-sĭk'lĭ-kal lĕ'tĕrā*), an ecclesiastical term originally applied to circular let-

ters released to all churches by the Pope or by a bishop or a council. Today, the term applies only to the encyclical letters sent by the Pope to bishops of the Roman Catholic Church. Encyclical letters generally contain either a condemnation or an evaluation of a current spiritual or political movement. Written in Latin, they are usually known by the words with which they begin. One of the most famous was the encyclical "*Rerum Novarum*" (1891), on socialism and the relationship between capital and labor, released by Pope Leo XIII.

Encyclopedia (*ĕn-sĭ-klō-pĕ'dĭ-ā*), ENCYCLOPAEDIA, or CYCLOPAEDIA, a work in which the various branches of human knowledge, including broad trends and background, are treated both as a whole, and also separately, in particular departments, and usually in alphabetical order. Naturally, with changing times and evaluations of knowledge and culture as well as findings of science, the character of encyclopedias has changed and developed. The authors of early encyclopedias attempted to treat all subjects of human knowledge exhaustively, but, as knowledge extended, vocabularies enlarged, and specialists multiplied, it became necessary to confine the treatise to a smaller limit of subjects or make the work departmental and specialized. It is assumed that Terentius Varro wrote the first extensive work of an encyclopedic nature (in Latin) in the year 30 B.C. Pliny the Elder soon after prepared his well-known "Natural History," which long ranked as a highly superior work. Farabi, an Arabian writer, prepared an encyclopedia in the Arabian in the 10th century, while Dominican Vincent of Beauvais, under the patronage of Louis IX of France, collected the whole sum of knowledge of the Middle Ages, to which an anonymous author appended a valuable addition several years later. The 13th century work of Bartholomaeus de Glanville was translated into English a century later by the Cornishman, John Trevisa. The term "cyclopedia" was first used as a book title by Ringelberg, of Basel, in 1541. In 1677 Johann Jacob Hoffman published his great German work, "The Universal Lexicon," at Basel, Switzerland, and in 1697 Pierre Bayle, the French critic, issued his well-known "Dictionary of History," in four volumes. It was not until this time, the 17th century, that encyclopedists began to use the vernacular in writing the articles, and also commonly to alphabetize the entries. Mention should be made of Thomas Corneille's "Dictionary of the Arts and Sciences" (1694). In 18th-century France, Diderot and D'Alembert (*qq.v.*) and the Encyclopedists—who included eminent French writers of the time—using a French translation of Ephraim Chambers' "Cyclopaedia," an English work, as a point of departure, produced the famous and advanced "Encyclopédie" (1751-65).



FRONTISPIECE FOR DIDEROT'S "ENCYCLOPÉDIE"

The most extensive of present German works are Meyer's "*Neues Konversations-Lexikon*" and Brockhaus' "*Konversations-Lexikon*." Ange de St.-Priest's "*Encyclopédie du XIX^{ème} siècle*" is a fine work in French.

The first English encyclopedia containing subjects in alphabetical order was the "Lexicon Technicum" published in 1704. Among the present English works are the "Encyclopaedia Britannica," first published at Edinburgh between 1768 and 1771, now published in the U.S., and which is famous for its long monographlike articles; and "Chambers' Encyclopaedia," first published under this name in ten volumes between 1859 and 1868. The English publications have been revised from time to time and have had a large sale in America. To make them more suitable in Canada and the U.S., American supplements or additions have been combined with the English publications. The 19th century brought forth the "Edinburgh Encyclopaedia" (18 vols., 1810-30); Wilks's "Encyclopaedia Londinensis" (24 vols., 1810-20); and Charles Knight's "Penny Cyclopaedia" (1833-46), which later became the "English Cyclopaedia" (1854-62). The 28-volume "Encyclopaedia Metropolitana" (1845) was arranged by Coleridge in four large divisions or topics: pure sciences, mixed and applied sciences, biography and history, and miscellaneous and lexicographic articles. Various other works also appeared with this or a different topical division. The world's most extensive encyclopedia is the Chinese encyclopedia, containing 5,040 volumes. An unusually artistic set is the "Italian Encyclopedia," which was first published under Mussolini.

Among the leading American publications are "The Encyclopedia Americana" (first published 1839-47), "American People's Encyclopedia," and the "Standard International Encyclopedia." Out of print are the longtime favorites, "Nelson's Perpetual Loose-Leaf Encyclopedia" (1909) and the "New International Encyclopedia" (1902). There are a number of children's sets, often found of great value by adults as well (e.g., "The World Book Encyclopedia" and "Compton's Pictured Encyclopedia and Fact-Index"). In addition, encyclopedias covering only a specific field or fields abound in America (e.g., Van Nostrand's "Scientific Encyclopedia"; "Encyclopedia of American History" by Richard B. Morris), and those primarily presenting a religious philosophy (e.g., "The Catholic Encyclopedia" and "The Jewish Encyclopedia"). Many biographical works have taken on an encyclopedic scope (e.g., "The Dictionary of American Biography" and the British "Dictionary of National Biography").

During the late 19th century, it became common to have experts in the various fields contribute articles which the editors revised only from the point of view of style and uniformity. A more recent trend has been toward less cumbersome, easier-to-handle, inexpensive sets, enabling children as well as adults of smaller homes and incomes to buy and enjoy using encyclopedias. Out of this conception came the one-volume encyclopedia, containing concise facts only, and also pictorial reference books, such as the "Larousse" in French and the "Knaur" in German. Among single-volume American works should be noted "The Columbia Encyclopedia," largely prepared by faculty members of Columbia Univ., and "Lincoln Library of Essential Information," a manual for daily reference.

Endecott (*ĕn'dĭ-kŭt*), or ENDICOTT, JOHN, colonial governor of Massachusetts, born in Chagford, England, in 1589(?); died in Boston, Mass., March 15, 1665. He came to America in 1628 and settled at Naumkeag, now Salem. Appointed governor of the Massachusetts Bay Colony (1629), he served for one year, turning over his authority to John Winthrop in 1630 and becoming his assistant. Deputy governor in 1641-44, he resumed the governorship in 1644 and held the position until 1665, except for a few years. A staunch Puritan, he did much to suppress the practice of the Quaker belief in the colony. His unsuccessful expedition against the Indians (1636) was a contributing cause of the Pequot War (1637). He took an interest in education and served as one of the early overseers of Harvard.

Endemic Disease (*ĕn-dĕm'ik dĭ-zĕz'*), in medicine, a disease constantly present in a greater or

lesser degree in a certain community or group of people, a certain district of a country, etc. Endemic diseases are generally caused by peculiarities in the soil, the water, the climate, etc.

Endicott (ĕn'dī-kōt), a village in Broome County, New York, 8 m. w. of Binghamton, on the Susquehanna River. It is served by the Erie and Delaware, Lackawanna and Western R.R.'s. International Business Machine's oldest and largest plant is located here. Other manufactures include shoes, electronic equipment, leather, and metal goods. Founded in 1901 by the Endicott Johnson Shoe Co., Endicott was incorporated as a village in 1906; it merged with the historic village of Union in 1921. Population, 1940, 17,702; in 1950, 20,050.

Endocrinology (ĕn-dō-krī-nōl'ō-jy), the study of the ductless glands and their internal secretions, and also the study of other glands which produce internal secretions although they have ducts. For example, the pancreas secretes digestive ferments in its glandular system which are emptied by ducts into the small intestines; but in the islands of Langerhans, the pancreas produces insulin, which is emptied directly into the blood stream to regulate carbohydrate metabolism in the animal organism, specifically to provide the ferment or catalyst which oxidizes the sugar in the blood. The ovaries extrude an egg or ovum at regular periods in female animals, but they also produce the female sex hormone (estrogen) which causes or regulates the secondary sex characteristics. Like insulin, the ovarian sex hormone is admitted to the blood stream. Paralleling the female sex hormone, there is the male sex hormone produced by the testes, independent of the manufacture of spermatozoa which are discharged externally; the male hormone (testosterone) is responsible for secondary sex characteristics in the male. Internal secretions, like insulin and the sex hormones, are called hormones as a group. The truly ductless glands are the pituitary, which produce pituitrin; the thyroid, which produces thyroxin; the parathyroids, about which little is known functionally; the thymus gland, which undergoes involution and disappears after puberty; and the suprarenal glands which produce epinephrin and a cortical hormone, the latter localized in the cortex of the suprarenal glands. Epinephrin has been made synthetically for so long that it is classed as an organic synthetic substance and its origin as an internal secretion of the suprarenal gland (*i.e.*, a hormone) has almost been forgotten. See also *Glands; Hormones; Secretion*.

Endoderm (ĕn'dō-dĕrm), zoological term, referring to the primary tissue comprising the inner layer of cells in the gastrula (*q.v.*). In subsequent stages it forms the lining of the essential

parts of the digestive tract and its derivatives.

Endodontia (ĕn'dō-dōn'shī-ā). See *Dentistry*.

Endogens (ĕn'dō-jĕns), one of the two primary classes of plants into which the vegetable kingdom is divided, the other being exogens. This designation of character is determined from the structure of the stem: the wood is in threads mixed with the pith and scattered throughout every part, never forming layers, and the bark cannot be peeled from the wood because of its being partly developed in the interior of the stem. The embryo has but one cotyledon, the leaves are nearly always parallel-veined, and the flowers have their parts in threes or a multiple of three, very rarely in twos or fours, but never in fives. In germination the original radicle issues from a sheath, and, in growing upward, each successive shoot of the stem issues from a former sheath. Palms, bananas, lilies, grasses, and sedges belong to this division.

Endometritis (ĕn-dō-mĕ-trī'ītis), in medicine, an inflammatory disease of the endometrium, the lining membrane of the uterus.

Endymion (ĕn-dīm'i-ŭn), a mythical youth of Greece whom Zeus had endowed with eternal youth, combining with it the faculty of sleeping as long as he wished and whenever he desired. When Selene saw him asleep on Mt. Latmos, her cold heart was warmed by the beauty of the youth, and she came from heaven every night to watch over and protect him. "Endymion," the beautiful poem of Keats, is based on this legend.

Enema (ĕn'ĕ-mā), or CLYSTER, in medicine, any fluid introduced into the rectum in order to affect movement of the bowels, sometimes necessary to give relief from constipation. Also, a method of artificial nourishment.

Enemy (ĕn'ĕ-mŷ), in military terminology, the term applied to either of two nations which are at war with each other. The state of enmity begins with a declaration of war, which may be either documentary or by actually taking up arms. Both parties in an armed conflict are called *combatants*, while all others that are interested but exempt from the operations of hostilities are known as *noncombatants*. During a state of war, when two or more nations are enemies to each other, all commercial relations are suspended. In some cases a state may permit its own citizens to trade with the enemy, but as a rule contracts made with an enemy cannot be enforced in the courts of law.

Neolithic (ĕ-nĕ-ō-lith'ik), an epoch which is intermediate between the Neolithic and the Bronze Age. It is often merged with the first epoch of the Bronze Age.

Energy (ĕn'ĕr-jŷ), the capacity to do work and overcome resistance. The work done in moving an object is equal to the product of the force applied and the distance the object is moved in

the direction of the force. (Work = wh , where w is the weight and h the height of a lifted object.) Thus, if a book weighing one pound is lifted to a height of one foot, the work done is one foot-pound, and the force applied and the motion are both in the same direction. However, if the book is pushed along the floor for a distance of one foot, the work done would not equal the weight of the book times the distance, but instead would be the product of the amount of friction between the book and the floor, multiplied by the distance the book is moved; for in this case the weight of the book is at right angles to the direction of the force, and is unimportant. Stored mechanical energy is called potential energy. It may be gravitational or elastic in nature. The one-pound book which was lifted one foot has gained one foot-pound of potential energy, for without additional force being applied to it, it can fall a distance of one foot. Thus the potential energy of a lifted object is its weight multiplied by its increase in height. We utilize one form of natural potential energy when we use the potential energy of falling water to operate machinery. Elastic potential energy occurs when elastic bodies are deformed. When the side of a rubber ball is pushed in, the internal forces within the ball push the side out again. The work done to depress the ball is equivalent to the work done by the internal forces in restoring the depression. The elastic ball has gained sufficient potential energy to restore the depression after the applying force has been removed.

Kinetic energy is that energy possessed by bodies in motion. A body in motion will continue in motion until its kinetic energy is transferred to energy of another form. The kinetic energy of a body in motion is equal to one-half of its mass times the velocity squared ($KE = \frac{1}{2} mv^2$, where KE is Kinetic Energy, m is the mass, and v represents the velocity. Since the mass of an object is its weight divided by the gravity factor, then $m = w/g$, where w is the weight and g is the gravity factor. The gravity factor is 32.16 feet per second per second, or in the metric system approximately 9.80 meters per second per second. The value for m may be substituted in the first equation, which will then be $KE = \frac{1}{2} \frac{w}{g} v^2$).

Energy can be converted from one form to another. For example, since a body will continue to move unless its kinetic energy is converted to another form, we apply brakes to stop a moving car. The brakes convert the kinetic energy of the car into heat energy by supplying frictional resistance. The car will continue to go forward even after the application of brakes until the work done against the retarding force is equal to the kinetic energy that the car possessed when the brakes were applied. When the book was dropped a distance of one foot, its potential energy was converted to kinetic energy. It struck the floor with a force of one foot-pound, which could be used to perform work. This principle was used in the early form of pile driver, where a heavy weight was raised and released to fall on the head of a pile, thus driving the pile into the ground with a force in foot-pounds equal to the weight in pounds of the lifted object multiplied by the distance in feet which it was lifted. The force driving the pile was equal to the potential energy of the weight used. In the case of a pendulum, its downward drop to dead center is due to potential energy, but its upswing on the opposite side is due to kinetic energy. Again its down-drop is due to potential energy, and its upswing due to kinetic energy. Since its potential and kinetic energy are equal, the pendulum should continue to swing forever. However, there is a third conversion of energy into another form applying here. The friction of the air and the friction at the bearing of the pendulum gradually transfer all the pendulum's energy into heat energy, and stop its motion. Thus the law of conservation of energy is that it cannot be created nor destroyed, it can only be transformed from one kind of energy to another. Later studies of the structure and fission of atoms have led to the incorporation of this law of the conservation of energy with the similar law concerning the conservation of matter. This is now stated: The sum of mass and energy, both expressed in the same units, remains constant. In other words, energy and matter may be converted from one form to another or even to each other.

Enfield (*čn'fjeld*), a town of Middlesex County, England, 9 m. N. of London. It is noted for the manufacture of rifles and small arms for the government. The noteworthy features include

CONVERSION FACTORS FOR ENERGY UNITS¹

	Joule	Kilogram meter	Foot pound	Gram Calories (20° C.)	Kilowatt hours
1 joule	1	0.1020	0.7376	0.2390	0.2778×10^{-6}
1 kilogram meter	9.807	1	7.233	2.344	2.742×10^{-6}
1 foot pound	1.356	0.1381	1	0.3240	0.3766×10^{-6}
1 gram calorie	4.184	0.4167	3.086	1	1.162×10^{-6}
1 kilowatt hour	3600000	367100	2655000	860300	1

¹ Smithsonian Physical Tables, edit. 1920, p. 197.

the town hall, the public library, and the remains of a royal palace of Edward III. Enfield has a celebrated school at which Keats studied. It was the home of Charles Lamb. Population, *ca.* 61,500.

Enfield, a town in Hartford County, Connecticut, on the Connecticut River, about 10 m. s. of Springfield, Mass. It is on the New York, New Haven & Hartford R.R. It has a public library and several fine schools. Among the enterprises is the Bigelow-Sanford carpet factory, one of the largest in the world. Other factories produce carpets, plows, sewing machines, timber products and implements. Originally settled in 1679, Enfield was part of Springfield, Massachusetts, until 1683. In that year it was incorporated as Enfield by Massachusetts, but was annexed to Connecticut in 1749. Population, 1940, 13,561; in 1950, 15,464.

Engelmann (ĕn'ġel-mán), GEORGE, botanist, born in Frankfort-on-Main, Germany, Feb. 2, 1809; died in St. Louis, Mo., Feb. 4, 1884. He studied medicine and the natural sciences at Heidelberg and Berlin. Subsequently he was connected for some time with the Univ. of Berlin, but came to the U.S., settling in St. Louis as a physician. In 1836 he founded a German newspaper, contributed to the "Proceedings of the American Academy," and secured an appointment under the government to prepare botanical reports in relation to North American plants. The most valuable portion of his work relates to the investigation of pines, cacti, and spurge. It is given in reports, including about 100, which have been published as the "Botanical Works of George Engelmann." His library and herbarium were bequeathed to the Missouri Botanical Gardens.

Engels (ĕng'ġl), FRIEDRICH, socialist, born in Barmen, Prussia, 1820; died in 1895. Co-author, with Karl Marx, of the "Communist Manifesto" (1847), he first worked in Bremen and Berlin, then collaborated with Marx and Arnold Ruge in publishing socialist documents in Paris (1841) and Cologne (1848-49). After joining the Communist League (1846), he took part in the Baden (Germany) revolution (1848-49), retiring thereafter to Manchester, England (1850-69), where he engaged in manufacturing. From 1870-95 he lived in London. He aided Marx in spreading his theories, was councilor secretary for Spain, Portugal, and Italy in Marx's International Workingmen's Association ("1st International"), and edited and published many Marxian works. Engels' own writings include: "The Origin of the Family" (1910), "Private Property and the State" (1910), and "Socialism Utopian and Scientific" (1892).

Engine (ĕn'ġin), a machine of complicated parts for utilizing some force in nature to perform work. See *Internal Combustion; Steam Engine*.



FRIEDRICH ENGELS

Engineering (ĕn-ġi-nĕr'ing), the art of making, building, or using engines and machines, or of designing and constructing public works, requiring special knowledge of materials, machinery, and the laws of mechanics. The range of knowledge required for the different departments is quite diversified, and each of these does not admit of strict definition as now divided. The seven principal divisions of this branch of learning consist of military, marine, mechanical, civil, electrical, aeronautical, and mining. *Military engineering* includes the planning, constructing, and maintenance of fortifications and gunnery, artillery, and telegraphy as applied in warfare. *Marine and naval engineering* are concerned with works partly of a military and partly of a naval character, such as the planning and construction of vessels of war, engines, and torpedoes. *Mechanical engineering* requires efficiency in the invention, contrivance, and adjustment of machinery. It is necessary that the mechanical engineer be acquainted with the quality and strength of the materials used, the power of steam, and the parts of engines. In addition it is essential that he should understand the construction of various kinds of mills, including those propelled by steam, water, and wind.

The work of a *civil engineer* covers the most diversified field of study and was not developed in England until about the middle of the 18th century. The engineers employed in that country before that time were generally obtained from Holland. Civil engineers have to do with the construction of railroads, canals, aqueducts, harbors, highways, bridges, and drainage works. *Electrical engineering* as an art sprang into recognition in recent years, owing to the larger and

more diversified uses of electricity in machinery and the arts. The work of an electrical engineer has to do with the construction, fitting, and care of electrical machinery and the building of electrical railways, telephones, and telegraph and oceanic cables. *Aeronautical engineering* is concerned with the construction of aircraft. *Mining engineering* is concerned with the construction and operation of copper, iron, coal, and other mines. The general tendency is to specialize more closely from time to time the various departments of engineering.

Many important associations of engineers have been organized and are maintained in the U.S. The most important among them are the American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Society of Civil Engineers, Western Society of Engineers, American Society of Agricultural Engineers, and the American Institute of Chemical Engineers. All of these have meetings at specified times to discuss important questions in reports, and support libraries and periodicals for general dissemination of knowledge and skill in their respective fields.

Engineers (*en-jī-nērz'*), in warfare, that branch of the army detailed to engineering operations, such as construction and operation of shelters, fortifications, bridges, and other structures, and many kinds of mechanical equipment. The first known engineers were the military engineers, though there was no official category as such in ancient times. A corps of topographical engineers served in the forces of Alexander the Great (356-323 B.C.); the English had an engineers' headquarters as early as 1350 A.D. Two hundred years later, a distinction was made between technical engineers and those engineers with duties in the field of combat operations. Not until 1757 was military rank conferred on a member of either group. The French army had a *Corps du Génie*, organized in 1690, to which both civilians and officers from other branches of the service were transferred.

The U.S. had three companies of sappers and miners in service during the American Revolution (1775-83), but the men were mustered out after the cessation of hostilities. A *Corps of Engineers* was finally organized in 1802 (supplanting the Corps of Artillerists and Engineers established in 1794) and stationed at West Point, N.Y., where they set up the U.S. Military Acad., of which they were in charge until 1866. The scope of duties of the Corps of Engineers was enlarged in 1863 by a merger with the Corps of Topographical Engineers organized in 1838. Military engineers have the reputation of being among the best in the country. They have served in the completion of many public works, such as bridges

and highways, including construction and operation of the Panama Canal (*q.v.*).

Present duties of the Corps of Engineers in the U.S. Army include construction of permanent fortifications, construction and maintenance of bridges, waterways, roads, railroads, etc., mapping and map reproduction.

In World War I, the Engineers totaled 295,849 officers and enlisted men in the field. They had come a long way from the original three companies; they became actual "Combat Engineers."

With the advent of World War II, steps to build up the corps were among the first taken. It finally reached a strength of 690,721 officers and men, being surpassed in numbers only by the Air Force and the Infantry.

With their intimate knowledge of huge, earth-moving equipment, the Engineers injected new tactics into modern warfare. They built the airfields, roads, bridges, and other facilities to speed up a conquering army. They prepared maps on a mammoth scale for the invading forces. They purified water for drinking and other uses. They fought with the Infantry, flew with the Air Forces, cleared the way through minefields for the Armor, and bridged the Rhine under fire. Their explosives smashed enemy fortifications, and the Engineers played an important part in the development of the atomic bomb (*q.v.*).

With the end of World War II, the Engineers turned back to their great peacetime task, rivers and harbors and flood-control work. They have a backlog of civil works projects that calls for the expenditure of more than \$4,000,000,000. They operate the largest map-making plant in the world. The Engineer Board at Fort Belvoir, Va., is the research department of the Engineer Corps.

England (*ing'gənd*), a country of Great Britain, the most important member of the United Kingdom of Great Britain and Ireland. It occupies all of the southern portion of the island of Great Britain, except the region in the west, which is included in Wales. It is separated from Scotland by the Solway Firth, the Cheviot Hills, and the Tweed River. The outline is in the form of a triangle, with the southern base 315 m. long, and the greatest distance n. and s. about 360 m. Its coast line is greatly lengthened by numerous windings and indentations, the most important of which are the Bristol Channel, the estuary of the Severn, Morecambe Bay, Solway Firth, the Wash, the mouth of the Thames, Lyme Bay, and Plymouth Sound. It is separated from Europe by the North Sea, the Strait of Dover, and the English Channel, and St. George's Channel and the Irish Sea separate Wales and England from Ireland. The area, according to official determinations, is 50,930 sq. m.

DESCRIPTION. The surface in the eastern and southern parts is low and gently undulating, and

is nicely diversified by slightly rounded elevations and broad, fertile valleys. Ranges of mountains and hills characterize the northern and north-western part, some of which extend into Wales and form a continuation of the highlands of Scotland. The highest elevations include the Cornish Heights, the Cumbrian Mts., and the Cheviot Hills; the last mentioned trend from Solway Firth parallel to the boundary line of Scotland. Scafell, one of the highest summits of England, is in the northern part and has an elevation of 3,210 ft. The Cumbrian Mountain region, famed as the Lake District, is in the northwestern part of England and has peaks that rise about 3,000 ft. above the sea. Toward the south, extending through Wales, are the Welsh or Cambrian Mts., and in the high peninsula of Devon and Cornwall are the lower summits of the Devon Range. As a whole the surface of England is more productive and better adapted to agriculture than any other part of the British Isles.

Numerous small streams drain the surface, the larger number of which flow into the North Sea, as the general slope is toward the east. Among the rivers which flow into the North Sea are the Thames, Humber, and Tyne, all of which are important for navigation. The Severn, Mersey, and Wye flow into waters tributary to the Atlantic, and are rendered useful for navigation by several canals. Other streams include the Trent, Wear, Avon, Tees, Dee, and Eden. However, the Severn is the most important in commerce since it flows through productive coal fields, and is the longest of the streams. The Mersey has its source in the Pennine Mts., and flows through a great manufacturing district. All of the streams and the coastal waters are rich in fish, including the cod, herring, mackerel, and haddock. Hull, Grimsby, and Yarmouth are centers of the fishing industry, but London is the most extensive fish market in the world, with its center at Billingsgate. The annual production of fish is valued at nearly \$50,000,000.

MINING. Coal is the most important mineral. It is produced in large quantities in Yorkshire, Lancashire, Derbyshire, and Nottinghamshire. Durham and York are among the centers of the coal mining region. Yorkshire and Derbyshire produce the greater portion of iron ore, and tin is obtained chiefly in Devon and Cornwall. Lead and zinc are mined in Northumberland and small quantities of copper, gypsum, and salt are obtained in different sections. Building stone of all kinds is abundant, including limestone, granite, and sandstone.

AGRICULTURE. The land is owned by a small proportion of the population, for the heritage of feudalism has left many large tracts in the hands of landlords who, in turn, rent parcels to those who farm it. Much care is exercised in till-

ing the soil and maintaining fertility. Estimated upon an acreage basis, more is paid for rent, labor, machinery, and fertilizers than in Canada or the U.S. A large number of agricultural laborers have been displaced by the adoption of labor-saving machinery, especially in the sections where cereals are the principal crops. Indian corn is not grown, hence wheat, rye, barley, and oats are the chief cereals. Beans and peas receive much attention and considerable profit is obtained from fruit farming and gardening. Most of the farming is a mixture of crop growing and raising of livestock. England is noted for the Durham, Devon, Hereford, and Sussex breeds of cattle and for Cotswold, Southdown, and Leicestershire sheep. Hogs of the Berkshire breed, which are raised extensively, have been naturalized in nearly all countries. Dairy farming receives marked attention. A superior class of horses is raised.

MANUFACTURES. Dating from the Industrial Revolution (*q.v.*), which began in England, manufacturing has occupied a commanding position. In the output of manufactures England is exceeded only by the U.S. This condition is brought about from the natural advantage of having an abundance of coal and iron, and the additional fact that England has a large merchant marine to encourage foreign trade. The textile industry is of first importance and the output consists largely of cotton and woolen goods. Manchester is one of the greatest centers of cotton manufacture in the world, while Leeds ranks among the largest wool producers. Sheffield and Birmingham are centers of the iron and steel industry. Linens are made in large quantities at Leeds and Barnsley and silk manufacturing is carried on in Coventry and Macclesfield. Other manufactures include pottery, earthenware, chemicals, machinery, pins and needles, steel pens, chinaware, cutlery, and firearms. England has some of the largest shipyards in the world.

TRANSPORTATION. A fine system of canals was constructed before railroads were built and these are maintained in a high degree of efficiency. Almost every part of the country can be reached by the navigable waterways, which consist of the coastal waters, estuaries, and streams, and a system of canals that penetrates the trade centers. However, the bulk of the transportation is by railways, which have lines in England and Wales that aggregate more than 20,000 m. Many of the canals are controlled by the railways and most of them have trunk lines into London.

COMMERCE. See *Great Britain*.

CITIES. London, situated on the Thames, is the capital of the United Kingdom and of Great Britain and is the largest city in the world. Seventeen cities, exclusive of London, have populations greater than 200,000. These include, in order of



ENGLISH INDUSTRIAL AND AGRICULTURAL CENTERS

size (based upon the latest official census): Birmingham, Liverpool, Manchester, Sheffield, Leeds, Bristol, Hull, Bradford, West Ham, Newcastle-on-Tyne, Stoke-on-Trent, Nottingham, Portsmouth, Leicester, Croyden, Salford, and Plymouth. About 80 per cent of the people of England and Wales live in towns and cities.

EDUCATION AND INHABITANTS. England is divided into 40 counties, each of which has the right of local self-government similar to that of the counties in Canada and the U.S. Educational facilities are provided under a system of local taxation and grants by the state. A nominal compulsory school attendance law is well enforced. Much of the instruction is in private and denominational schools. A board of education has control of elementary education under a law which went into effect in 1900. Oxford and Cambridge were the only great centers of higher learning at the beginning of the 19th century, but within that century four others were organized. These include the universities of London, Durham, Manchester, and Birmingham. In the 20th century, universities were established in Liverpool, Leeds, Sheffield, Bristol, and Reading.

Density of population is about 745 per sq. m.

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Pop. in the latest census totaled 37,794,003.

GOVERNMENT. See *Great Britain*.

LANGUAGE. English belongs to the Teutonic or Germanic branch of the Indo-European family of languages. Like other Teutonic languages, English places the primary stress of many of its words upon the root syllable, and it forms the past tense and past participle of most verbs by adding *d* or *t* to the verb (*pose, posed*). It is differentiated from the other Germanic tongues by a large and highly composite vocabulary amounting to more than half a million words, and, in structure, by (1) an almost complete loss of inflectional endings (changes in the endings or root vowels of words to indicate changes of meaning, such as *case* in nouns and *tense* and *number* in verbs), and (2) the development of firmly fixed patterns for word order.

Three periods in the history of the English language are generally recognized: *Old English*, extending from the time of the invasion of Britain (ca. 450) by the Angles, Saxons, and Jutes, until the century after the Norman Conquest in 1066; *Middle English*, from about 1150 until about 1450; and *Modern English*, from

1450 to the present. The Modern English period is often subdivided into Early Modern English (1450-1700) and Late Modern English.

Old English can be characterized as a language of full inflections, Middle English as one of leveled inflections, and Modern English as one of lost inflections. This means that Old English rather resembles modern German in the way in which the nouns, pronouns, adjectives, verbs, and articles are declined or conjugated. During the Middle English period these different inflectional endings became very much alike; they were generally reduced to a single unstressed vowel pronounced nearly like the final sound of *Cuba*, and usually spelled *e* (observe Chaucer's *roote, sunne, wente*). Among the sweeping changes which took place in the language during the 15th century was the loss in pronunciation of the final unstressed *e*, leaving the structure of the language virtually as it is today.

During the Middle and Modern English periods the English vocabulary has increased enormously as a result of borrowing from foreign languages. Even during the Old English period, the reintroduction of Christianity from Rome (in 597) led to the acquisition of a considerable number of words from Latin; and the Scandinavians, set-



THE ROYAL EXCHANGE IN LONDON

ting down after repeated incursions into English territory, also contributed many words. However, the first really great influx of foreign loan-words into the English vocabulary came from the French, first as a result of the Norman Conquest, which submerged English for a century as a literary language, and secondly, as a consequence of the close political and cultural ties between England and France during the 13th and 14th centuries. The Revival of Learning, during the Renaissance (*q.v.*), gave a renewed impetus to borrowing from the Latin. Finally, England's growing position as a world power and the rapid development of America resulted in the introduction into English of words from languages in every part of the globe. The result is a total vocabulary that is at once heterogeneous and extremely large.

Naturally, with so enormous a potential vocabulary at his command, the average individual speaker of the English language will master only a relatively small part of it. Many attempts have been made to determine the size of the vocabulary of the average individual, but the results have differed widely. Some studies have reported the average vocabulary of adult persons to be from 3,000 to 4,000 words, whereas other investigators have declared that second-grade children have a vocabulary of 4,480 words, increasing to 12,000 in the eighth grade, and to 20,000 among college students. The vocabulary of educated adults has been reported as 8,000, as 30,000, and as 50,000. These differences result from lack of agreement on what constitutes a word, and from differences in the method of word counting, such as analyses of "reading" vocabulary as compared with "use" vocabulary. Recent conclusions of students of language, however, seem to favor acceptance of the larger figures.

The determination of word frequency in the language has been somewhat more successful,

largely because of the efforts of Professor E. L. Thorndike (*q.v.*) and his associates at Teachers College of Columbia University. By tabulating more than 5,000,000 running words drawn from a variety of sources, these investigators have determined the 30,000 words in the English language which are used most frequently and over the widest range of material. "The Teacher's Word Book," embodying the results of this study, has been used in the writing of textbooks for children at various grade levels, in the simplification of difficult reading material, in the preparation of Army manuals, in the teaching of English as a foreign language, and in the preparation of dictionaries. A further refinement of this type of study has been instituted by Professor Irving Lorge, who, in conjunction with Thorndike, began a semantic count—that is, a tabulation of the frequency of separate meanings of the words in the English language.

Among the various limited vocabularies of English which have been developed is one of 850 words, designed by C. K. Ogden, of Cambridge Univ., and called *Basic English*. This differs from other limited word lists in that it is based not upon frequency but upon a systematic theory of definition which was expected to provide sufficient words from various common fields to meet the needs of ordinary conversation. Basic English consists of 200 "picturable objects" and 400 "general names" (concrete and abstract nouns), 150 "qualities" (adjectives), and 100 "operators" (adverbs, conjunctions, prepositions, pronouns, verbs, and articles). The extreme compression of this vocabulary was rendered possible in large part by limiting it to 18 verbs. Although designed originally to serve as an international auxiliary language, Basic English has been used with some frequency as a first step in the teaching of English as a foreign language.

One aspect of English which must not be over-

looked is the colloquial or spoken language as distinct from the written. In general, when we speak, we select simpler words and our sentences incline more to the simple and compound rather than to the complex structures, to direct word order rather than periodic. ("When, upon entering, I saw him there, I was greatly surprised"; "I went in and there he was, and was I surprised!") The spoken language has at its command both stress and intonation, for which we must compensate in the written language by a greater regard for logic in the ordering of words. All reputable scholars and dictionaries are careful to insist that *colloquial* is not a term of condemnation, but that it refers merely to the language as spoken informally. Colloquial English is not inferior to written English; it is merely another variety of the language, entirely appropriate to its own purpose.

English is now spoken by more than 220,000,000 people, the majority of whom live in the United States. The English of the United States and that of Great Britain differ chiefly in vocabulary and pronunciation, though not to the extent of being mutually unintelligible. In inflection and syntax the two great branches of English are virtually identical. Some differences in pronunciation may be accounted for by the retention in American English of 16th- and 17th-century features of British pronunciation, in which, for example, the vowel of *path* was identical with that of *hat*, and in which there was secondary stress upon the third syllable of *secretary* and *dictionary*. Other differences are traceable to the early separation and divergent developments of specific features of the two "languages." Differences in vocabulary are due in part to American word borrowing from those languages with which the English-speaking colonists came into contact in their conquest and development of the American continent: American Indian, French, Spanish, Dutch, and German. In addition, certain words which had the same meaning on both sides of the Atlantic during the 17th and 18th centuries often acquired a new meaning in England but retained the older meaning in America (e.g., *bug*), or acquired a new meaning in America but retained the older sense in England (e.g., *saloon*). Finally, there has been a strong tendency in America toward the creation of compound words: *bullfrog*, *corn belt*, *cowcatcher*, *dark horse*, and *roasting ear* are all American innovations. The influence of American motion pictures and manufactured products has made American terms more widely understood in England today than they were at the beginning of the present century.

DIALECTS. Each of these two great divisions of the English language is further subdivided into a number of regional dialects. In England, where the local dialects still persist among the un-

schooled to a considerable degree, these regional differences go back to the very beginnings of the language. In Old English there were four well-marked dialects: Northern, spoken north of the Humber; Mercian, spoken between the Humber and the Thames; Kentish, spoken in Kent and the surrounding southeastern territory; West-Saxon, spoken in the south central and southwestern portions of the island. At that time the differences between the various dialects consisted chiefly in pronunciation and to a less marked degree in vocabulary. During the Middle English and Early Modern English periods differences in inflection and syntax developed as well. Relatively large dialect areas often came to have points of difference within themselves, so that today even within a single county, such as Yorkshire, there is an eastern and a western type of speech.

Four major regional types are generally recognized within the U.S.: New England, Middle Atlantic, Southern, and General American. By the latter term is meant the relatively undifferentiated type of speech prevailing west of the Appalachians and north of the Mason-Dixon line. In New England and the South the coastal type of speech is usually somewhat different from that found slightly inward, the lines of difference generally corresponding to geographical features. For example, the Green Mountains, the Berkshire Hills, and the Connecticut River separate eastern from western New England speech, and the Appalachians divide tidewater Southern from hill Southern. In the Middle Atlantic states, the speech of western Pennsylvania is distinct from that prevailing in the New York metropolitan area and also from that which is to be found in eastern Pennsylvania, Delaware, and New Jersey.

For a discussion of standards of usage, see *Grammar*. See also *Americanisms*; *Language*; *Pidgin English*; *Reading*.

LITERATURE. English literature is naturally divided into three periods—from its beginning to the Norman Conquest in 1066, from the Norman Conquest to the Reformation under Henry VIII in 1527-47, and from the Reformation to the present time. The literature of the period antecedent to the conquest may be divided into Celtic, Latin, and Anglo-Saxon, and is of a form that cannot be read except by students making its study a specialty. The most eminent Celtic writers include Llywarch Hen and Merlin or Merddhin, and the Latin writers include Ethelwerd and Bede. The Norman period extends from the Conquest in 1066 to the commencement of English literature in 1255. Before the Conquest a form of Anglo-Saxon literature had developed. It was represented chiefly in the "Anglo-Saxon Chronicle," which continued to be published until 1154, when the native language went practically out of use. At that time Latin was generally used in history,

law, and philosophy, while French was employed in poetry and the literature for general reading.

With the loss of Normandy to France in 1204, England effectively broke its cultural as well as political ties with the continent, and became more distinctively English. One result was the gradual rise of the English language to dominance in the island. We find English employed by Roger Bacon, Geoffrey of Monmouth, and Geoffrey Chaucer. Chaucer is considered to be the first great poet of England, and, though a student of French romance and chivalry, he wrote verse in English. He translated "The Romance of the Rose" into English, and in later years made a study of Italian literature, thus giving the English the benefits of translations from Dante, Boccaccio, and Petrarch. Among the most famous writings of Chaucer are "The Parliament of Fowls," "The House of Fame," and "Canterbury Tales." Though city-bred, Chaucer was a lover of the fields and flowers and showed a marked sensitiveness to the charm and beauty of the world. His "Canterbury Tales" is the most noted of his works. It is written in verse and deals with a group of 30 people journeying from London to Canterbury, where they intended to visit the shrine of St. Thomas à Becket. The poem relates the different stories told by each member of the company. Among the contemporary writers of Chaucer are the poets, John Gower (1325-1408) and William Langland (1332-1406), and the prose writer, John Wycliffe (1324-84).

The writers of England between the time of Chaucer and the end of the 16th century were largely imitators of that poet, including James I of Scotland, John Skelton (1460-1529), and Sir Thomas More (1478-1535). It may be said that this period was generally barren, but with the invention of printing an appetite for literature began to awaken. This was due largely to the fact that the crusades came in contact with Greek scholarship in Constantinople and Southern Europe, where a taste for Greek and Roman literature was still alive. When the Turks drove the Greek scholars from Constantinople in 1453, they spread rapidly toward the West and found many young persons eager to learn the classics and philosophy of Greek and Roman masters. There was not only a tendency to journey to Italy for the purpose of studying, but scholars were induced to come to Western Europe and gradually found their way to England. It was the height of ambition to be able to read Homer and Plato, and to discourse on the writings of Demosthenes and Cicero.

The discovery of America induced a greater interest in geography, opened new avenues of commerce and social activity, and rapidly prepared for a transition from the Middle Ages to

the dawn of modern learning. While Erasmus, the Dutch scholar-philosopher, was teaching Greek at Oxford, he aroused an interest in the New Testament, and published "The Christian Soldiers' Dagger." William Tyndale translated the New Testament into English; he published it in Germany in 1525 and circulated it extensively in England. In the meantime the Reformation in England came on in the reign of Henry VIII, who separated England from the Roman Catholic Church. Sir Thomas More, the author of "Utopia," was beheaded, and many other writers suffered a similar fate.

Among the prominent literary men immediately after the Reformation are Sir Thomas Wyatt, the first artistic poet, and Henry Howard, Earl of Surrey, a writer of sonnets and blank verse. These and other writers gave an impetus to literature by making songs and sonnets national, and prepared the way for the Elizabethan age of literature. This age is famous because of the large number of men who produced writings of merit, such as Edmund Spenser, William Shakespeare, Ben Jonson, Roger Ascham, Francis Bacon, and John Lyly (*qq.v.*). Other writers of this period include Peele, Marlowe, Greene, Herbert of Cherbury, Middleton, Marston, Raleigh, and North (*qq.v.*). The writings of Shakespeare, which appeared between 1585 and 1616, are the most prominent of the period and in many respects are the finest in English literature. They possess a wealth of imagination rarely equaled, and embody passages of the gravest wisdom, the purest motivation, and the tenderest feeling.

Ben Jonson holds a high rank as a song writer and produced a number of excellent comedies and other plays. Philip Massinger (1583-1640) ranks among the dramatists of this period; Abraham Cowley (1618-67), among the lyric poets; Thomas Hobbes (1588-1679), among the historians; and John Milton, among the poetical and prose writers. Milton's "Paradise Lost" is a masterpiece of English literature. Other writings of Milton include "Paradise Regained," "Il Penseroso," "L'Allegro," and "Areopagitica," a classic plea for freedom of the press. Religious writers of the period include James Usher (1581-1656), Jeremy Taylor (1613-67), John Biddle (1615-62), and Richard Baxter (1615-91). John Bunyan (1628-88) marks an epoch in English literature: few works have been so widely translated and so extensively read as his masterpiece, "Pilgrim's Progress."

John Dryden wrote many popular plays after the Restoration. He is the author of "The Hind and the Panther," a religious discussion, and "Absalom and Achitophel," a famous satire. The death of Dryden in 1700 marks the beginning of the so-called Augustan age in English literature, whose greatest poet is Alexander Pope. This era witnessed the advent of many scientific and

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philosophical writers, among them Sir Isaac Newton, John Ray, and John Locke. Other writers of the period include Richard Steele, Joseph Addison, and Jonathan Swift. James Thomson is best known for "The Seasons," Thomas Gray for "Elegy Written in a Country Churchyard," and Daniel Defoe for "Robinson Crusoe." Samuel Richardson published "Pamela," one of the first modern novels, and Henry Fielding is remembered for "Joseph Andrews," "Tom Jones," and other novels.

Samuel Johnson is the literary representative of the second half of the 18th century. His works include "Lives of the Poets," "The Vanity of Human Wishes," and his great "Dictionary." His biographer, James Boswell, is also important. The name of Oliver Goldsmith is inseparable from that of Johnson. He wrote "The Vicar of Wakefield," "The Deserted Village," and "She Stoops to Conquer." William Cowper, a poet of the latter part of the century, is noted for his religious sentiment; William Blake followed a similar mystical tradition. Robert Burns' Scottish lyrics are typical of his time. Richard Sheridan wrote "The School for Scandal" and other popular plays. David Hume, Adam Smith, Edmund Burke, and Edward Gibbon are among the historians and political writers of the latter part of the 18th century.

As the 18th century drew to a close, a new influence began to make itself felt in English letters. The period which has come to be designated as the "Romantic Revival" was, in essence, a blossoming of the individual as an artist. In the intense and personal search for beauty, William Wordsworth is a recognized leader. His "Ode: Intimations of Immortality" expressed a sense of mystic communion with nature, and indicated to many future writers that human perception is the sole pathway to art. Samuel Coleridge also wrote in this new tradition, and it reached a poetic climax in the exquisite lyrics of Lord Byron, John Keats, and Percy Shelley.

The writers associated with the Romantic Revival cannot be said to have subscribed to any joint literary doctrine. They had in common, however, humanitarian and liberal tendencies and an emotional quality unlike the intellectualism and restraint of the preceding age. Matthew Arnold's lines in tribute to Byron may, in this respect, be taken as a typical appreciation:

"He taught us little; but our soul
Had felt him like the thunder's roll."

In prose, too, the Romantic Revival was notable. Sir Walter Scott and Jane Austen brought to a high degree of perfection the art of infusing life into history and everyday existence. But if creative literature had become individualistic, so had criticism. Among the essayists and critics of the time, it became popular to discuss a great



RURAL ENGLAND

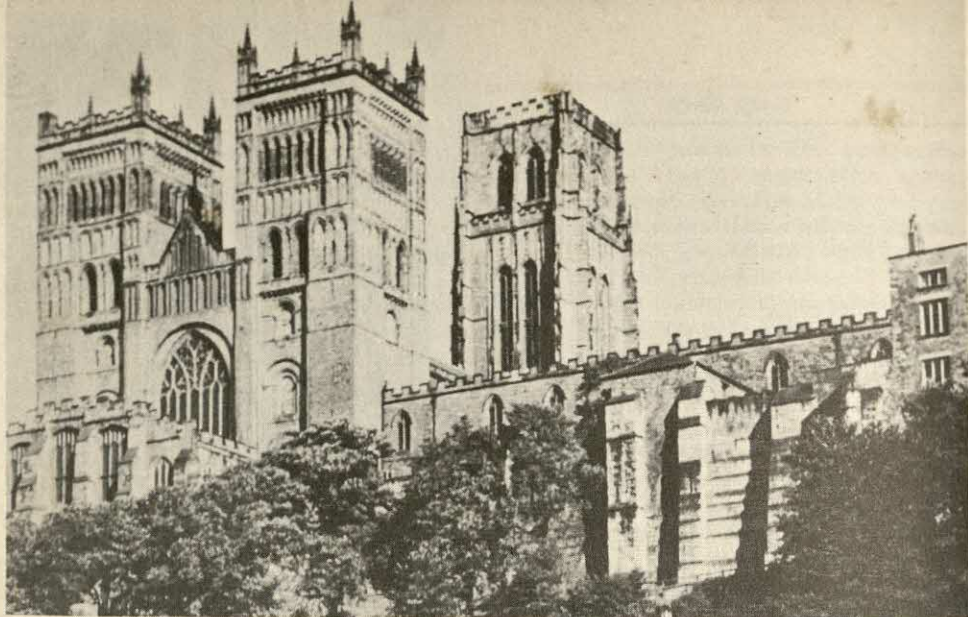
Many English villages built during the 16th and 17th centuries have not changed their characteristics

variety of subjects from the standpoint of purely personal reaction. Thomas De Quincey, Charles Lamb, William Hazlitt, Samuel Coleridge, and others wrote with a charm and insight rarely equaled by earlier or later essayists.

While the Romantic writers of the first third of the 19th century sought to discover truth through self-examination, science was leading the way toward a more objective philosophy. The succeeding literary period, known to the world as "Victorian," was to be profoundly influenced by the new scientific, historical and political philosophies which might be typified by Darwin's theory of evolution. The Victorian Age in literature was named for the English queen, and in many respects reflected her personality: quiet, discreet, dignified, and blended with a strong sense of propriety. Alfred, Lord Tennyson may be considered as the major poet of transition, combining as he did some of the lyric quality of the Romantics with the prosaic scholarship of the later Victorians. Robert and Elizabeth Browning infused new depths of feeling into their poetry, and helped to demarcate the intellectual from the purely personal beauty of their predecessors.

Among the more prominent non-English influences found in the writings of Victorian poets is that of Greek classicism, embodied in the works of Matthew Arnold, Algernon Swinburne, and others. The more tempestuous spirit of the Italians is reflected by Dante Gabriel Rossetti and his sister Christina.

Meanwhile, in its other major branch, the novel, English writing moved rapidly ahead. With the growth of literacy, the novel became increasingly a method for the expression of ideas, and helped greatly to form popular attitudes. Within the limits of Victorian propriety, there is hardly a subject of human thought and experience that did not find expression in the works of the leading novelists. Society was inspected by William Thackeray, and found to be a fit subject for satire; Charles Dickens proved himself proficient



DURHAM CATHEDRAL

This cathedral, dating back to the late 11th century, is a fine example of Norman architecture even though later additions are in Gothic and perpendicular style. English cathedral architecture from the 11th to the 15th century is of special importance in the development of Gothic style

in this *genre* in addition to being a zealous social reformer and master of historical fiction. The apparently colorless and prosaic life of the English countryside emerged from the novels of Emily and Charlotte Brontë, George Eliot (Marian Evans), Anthony Trollope, and others as richly emotional experiences.

Nor was the period lacking in more imaginative fiction. The often flamboyant romances of Bulwer-Lytton, the pregnant whimsy of Robert L. Stevenson and Lewis Carroll (C.L. Dodgson) have continued to stir the fancy of generations of English and American readers.

In the fields of essay, criticism, and history, the 19th century is particularly rich. A vast interest in social and scientific questions produced countless works by an astounding number of trenchant thinkers. Jeremy Bentham, who had earlier revolutionized English legal thought, left a body of advanced social doctrine which had great influence on the later works of such men as James and John Stuart Mill and Herbert Spencer. History, biography and similar subjects attracted Thomas Carlyle, Lord Macaulay, James Froude, William Lecky, and others; Charles Darwin and Thomas Huxley are notable among the scientific writers; Cardinal Newman was the foremost contributor to theological literature; and Matthew Arnold and John Ruskin each won an important place among the critics of literature and art.

One further observation regarding English writing since the early 19th century seems justified at this time. The growing social importance of the middle-class masses interacted upon educa-

tion and literature and helped foster a rapid rise in literacy. Literary works were demanded by, and supplied to, larger audiences than had ever before been known. But in the very process of bringing popular literature to birth, English writing all but destroyed itself: the huge expansion of the writing and publishing business, catering to temporary, popular moods, swamped the significant output of the important men of letters. How much good literature might have been lost in the deluge is impossible to know; it is certain that the demands of the market constituted one of the many restrictions placed upon creative writing. Far too many subjects were artificially excluded from the realm of "good taste," and the prevailing atmosphere of delicacy and reserve made all the more striking the works of great gusto and realism that marked the equivalent period in other countries. The Norwegian dramatist, Henrik Ibsen, and such French writers as Emile Zola, Gustave Flaubert, Guy de Maupassant, Anatole France, etc., effectively pointed the way for English letters. Samuel Butler was among the first to take up the challenge and throw off the restraints that characterize Victorian writings. In perspective, it may also be said that such late Victorian realists as George Gissing, Thomas Hardy, and George Meredith helped to round off the period and bring about the greater freedom of the 20th-century novel. Although Queen Victoria lived until 1901, she survived the literary age named for her by about ten years.

With the weakening of literary conventions in the 1890's, the scope of acceptable topics widened rapidly. In poetry, novel, drama, and essay, such

notable writers as G.B. Shaw, Oscar Wilde, Rudyard Kipling, G.K. Chesterton, Sir James M. Barrie, and others, satirized, analyzed, denounced, and expounded old and new views on a myriad of subjects. Long-vanished oriental culture was reopened to English view by the striking and original translations of Fitzgerald ("Rubaiyat") and Burton ("Arabian Nights"). The Anglo-Irish revival, spearheaded by John Synge, W.B. Yeats, and George Russell (Æ) helped reinvigorate a rapidly dwindling literary tone.

While it is relatively easy to pass judgment on earlier chapters in English literary history, anything that may be said about more recent developments will necessarily be subject to the corrections of time and perspective. The greatest influence in the 20th century was exerted by the political turmoil which produced two great wars, the rise of fascism, communism, and other world forces. It is natural that such vital movements should leave their imprint upon the mind and work of English writers. Few indeed failed to take some stand in the world conflict, and strong topical feeling was reflected in their literature. Playwright G.B. Shaw converted the English stage of the early part of the century into a forum for the discussion of political theories. Even those writers who refused to enter current controversy were marked by that very refusal, and the absence of politics in writing was regarded as politically significant. The instability of his own world suggested to H.G. Wells the themes for his fantastic visions of future worlds. Joseph Conrad, Polish-born writer who adopted the English nation and its language, brought with him a measure of continental outlook. Instead of immediate problems, his novels attempted to explore the permanent values by which men live.

While Conrad, George Moore, Arnold Bennett, Virginia Woolf, D.H. Lawrence, Katherine Mansfield, James Joyce, and many other important writers searched the human heart and mind for the source of their materials, John Galsworthy and a notable school of similarly minded authors continued to deplore social injustice. A measure of compromise was attempted by many younger writers who combined topical problems with examination of the hidden springs of human action. E.M. Forster, Evelyn Waugh, Norman Douglas, and Aldous Huxley are but a few of the large number for whom social satire or protest became the medium for the expression of their deepest thoughts on fundamental questions.

Other novelists noted for their striking perceptions of English and colonial life include Somerset Maugham, J.B. Priestley, Hilaire Belloc, W.H. Hudson, and the humorist P.G. Wodehouse.

Poetry, meanwhile, drew the talents of many Englishmen. Such writers as Thomas Hardy, Rudyard Kipling, and D.H. Lawrence, although

known primarily for their novels, also wrote remarkable verse. Other important poets are Robert Bridges, John Masefield, A.E. Housman, and American-born T.S. Eliot. See also articles on individual authors.

HISTORY. England was invaded by the military forces of Julius Caesar in 55 B.C. and later became a Roman possession. Its history proper begins with the withdrawal of the Roman forces in the early part of the 5th century A.D., when Germanic peoples invaded portions of what was known as Albion or Britain. These Germanic peoples first moved west from Germany into the lands now called Denmark and Schleswig. Later many removed to England, being attracted by opportunities of development and numerous settlements that had previously been made by the Gauls, Germans, Iberians, Dacians, Italians, Phrygians, and others that located in the country during the time of the Roman occupation. Those conquering the country were made up largely of Jutes, Angles, and Saxons, the term Anglo-Saxon originating from the latter two, and the country itself deriving its name from the Angles or Inglisc.

The German ideas and forms of local government began to be introduced about the middle of the 5th century, and from them the language and civil institutions largely originated. From this mixture of races, among them the Celts, sprang the people who became the English nation.

The early history and events that led to the final building of an independent kingdom were complicated by many civil and religious struggles, which extended themselves over a period including many centuries. The Jutes formed settlements in the Isle of Wight, Kent, and adjacent regions, while the Saxons occupied tracts in the south, and the Angles in the north. The struggle for supremacy which resulted from conflicting claims covers a period of 150 years. It finally terminated to the advantage of the Teutonic tribes, who ultimately occupied the entire southern portion of Britain, except only Wales, West Wales, and Strathclyde. The territorial divisions were small, though seven of the most important formed an alliance of friendship known in history as the *Heptarchy*. This protracted struggle in the course of time resulted in annexing the smaller divisions to the more powerful neighbors. Egbert succeeded in securing sovereignty over the seven kingdoms in 827, and made himself ruler of a large part of the country, to which the name England was first applied. Before the Teutonic conquest Britain was largely isolated from continental Europe, but soon after the learning and culture of older civilization was introduced, a closer intimacy was established, and a written literature began to form. Though the conquerors were strangers to Christianity, they were converted district by district after a severe contest, which reached its

height in the 7th century. Soon after, the Danes began to make incursions.

Alfred the Great ascended the throne in 871 and succeeded in defeating the Danes at Ethandune in 878. For more than a century, spasmodic conflicts with the Danes kept England divided. In 1016 Edmund II was compelled to surrender to Canute all of England except Wessex. After Edmund's death in the following year, Canute absorbed Wessex and continued to rule as an English king while holding a vast and undefined Danish empire. His reign was popular among the English, to whom he granted their first charter of liberties. He was followed by two Danish kings who managed the government with moderation, though their reign was disturbed by Norman incursions and Saxon revolts. Two Saxon kings followed the Danish, but in 1066 the country was conquered by William of Normandy. This military achievement, known in history as the *Norman Conquest*, caused the country to be governed by Norman kings for 69 years. After the death of Henry I, Stephen, son of the Count of Blois, raised an army in Normandy with which he proceeded to England and claimed the kingdom. Civil war followed for a series of years, but finally ended in a peace, in which Stephen was recognized as sovereign for life, but Henry, son of Matilda, daughter of Henry I, was to succeed him on the throne. As Stephen died in 1154, Henry II became his successor, and the Plantagenet line of succession ruled England for 245 years.

During the reign of the Plantagenet line the country was more or less disturbed by conflicting claims of the people against the feudal system of land ownership established after the Norman Conquest. Wars with Wales and Scotland likewise tended to distress the government, but they operated to unite the people of England as against foreign invasion, although the people were divided by the conflicting pretensions of the Lancastrians and Yorkists. The claims of the people to their ancient rights and liberties were recognized in the *Magna Carta*, the Great Charter, on June 15, 1215, and, under the leadership of Simon de Montfort, Henry III was seized and required to pledge the organization of a Parliament, which gave the people the right of representation and led to the permanent establishment of the House of Commons. Richard II was compelled to surrender to 60,000 malcontents. He was succeeded in 1399 by Henry IV, the first representative of the house of Lancaster, which governed England for 62 years. The persecution of the Lollards took place in the reign of Henry IV. He was succeeded by Henry V, in 1413, who gained marked successes over the French and was to succeed to the throne of France. However, the advantages he gained were lost by his son, Henry VI, largely through the achievements of Joan of Arc. His reign was

succeeded by the York dynasty after a long line of struggles for supremacy.

Henry Tudor, Earl of Richmond, won (1485) the Battle of Bosworth in which Richard III was slain. He ascended the throne as Henry VII. During the reign of his successor, Henry VIII, England was disturbed by the Reformation. Events occurred quickly by which Elizabeth ascended the throne and became the nominal head of the Protestant faith. Her reign was characterized by remarkable progress in architecture, literature, and commercial competition for colonization in opposition to Spain. She was succeeded by James VI of Scotland, son of Mary Queen of Scots, who assumed the title of James I of England. This placed the Stuarts upon the throne after a long contention, but their sovereignty was weakened by constant disputes with the Parliament and the rise of the republican forces, stimulated largely by Oliver Cromwell. Cromwell succeeded in establishing the Commonwealth in 1649, with himself as Lord Protector. However, it survived him but a short time, terminating abruptly under the feeble protectorate of his son, Richard, and Charles II was called to the throne by the Restoration of 1660.

The old dissensions between the king and Parliament soon broke out anew and William of Orange, supported by the Whig party, drove James II, successor of Charles II, from the country and became the first parliamentary king. When Queen Anne ascended the throne, she found the grand alliance with Holland and Germany of much value. Her government was further strengthened by the success of her army at Blenheim in 1704 and at Ramillies in 1706, under Marlborough. The history of England became merged into that of Great Britain in 1707, by virtue of the act of union passed in that year uniting England and Scotland. In 1714 the Hanover dynasty succeeded to the throne and the last attempt of the Stuarts was thwarted in 1715. For more recent history, see *Great Britain*.

Below is a list of English sovereigns:

DYNASTY AND TITLE	BEGAN	YEARS
ANGLO-SAXON LINE		
Alfred, King of Wessex	871	30
Edward I, King of Wessex	901	24
Athelstan, King of England	925	15
Edmund I	940	6
Edred	946	9
Edwy	955	4
Edgar	959	16
Edward II	975	3
Ethelred	978	38
Edmund II	1016	1
DANISH LINE		
Canute	1017	19
Harold I	1036	3
Hardicanute	1039	2

ENGLAND, CHURCH OF

SAXON LINE		BEGAN	YEARS
Edward III.....	1041	25	
Harold II.....	1066	..	
NORMAN LINE			
William I.....	1066	21	
William II.....	1087	13	
Henry I.....	1100	35	
HOUSE OF BLOIS			
Stephen.....	1135	19	
PLANTAGENET LINE			
Henry II.....	1154	35	
Richard I.....	1189	10	
John.....	1199	17	
Henry III.....	1216	56	
Edward I.....	1272	35	
Edward II.....	1307	20	
Edward III.....	1327	50	
Richard II.....	1377	22	
HOUSE OF LANCASTER			
Henry IV.....	1399	14	
Henry V.....	1413	9	
Henry VI.....	1422	39	
HOUSE OF YORK			
Edward IV.....	1461	22	
Edward V.....	1483	2	
Richard III.....	1483	2	
HOUSE OF TUDOR			
Henry VII.....	1485	24	
Henry VIII.....	1509	38	
Edward VI.....	1547	6	
Mary.....	1553	5	
Elizabeth.....	1558	45	
STUART LINE			
James I.....	1603	22	
Charles I.....	1625	24	
COMMONWEALTH			
Oliver Cromwell.....	1649	10	
Richard Cromwell.....	1658	..	
STUART LINE			
Charles II.....	1660	25	
James II.....	1685	3	
HOUSE OF ORANGE			
William and Mary.....	1688	14	
STUART LINE			
Anne.....	1702	12	
HANOVER LINE			
George I.....	1714	13	
George II.....	1727	33	
George III.....	1760	60	
George IV.....	1820	10	
William IV.....	1830	7	
Victoria.....	1837	64	
HOUSE OF SAXE-COBURG AND GOTHA			
Edward VII.....	1901	9	
HOUSE OF WINDSOR			
George V.....	1910	26	
Edward VIII.....	1936	$\frac{3}{4}$	
George VI.....	1936	15	
Elizabeth II.....	1952	..	



British Official Photo

CANTERBURY CATHEDRAL

The spiritual center of the Church of England, the Canterbury Cathedral is situated in the ancient Kentish town where St. Augustine established Christianity in England in 597. The present building was begun in 1070

to it in ancient times. As at present organized, it dates from the time of Henry VIII, who abolished papal authority in England and established the independence of the Church of England. He became the supreme head of the church, dissolved the monasteries, and convoked an assemblage of clergymen to pass upon ten articles of faith drawn up at his suggestion. This convocation declared against the invocation of saints, the worship of images, and the belief in purgatory, and expressed the view that the whole Christian faith is to be found in the Bible. This was soon followed by the publication of the Bible in English, which greatly tended to spread the reformed doctrine, and prayers and services began to be in English. During the short reign of Edward VI, son of Henry VII, the reforming element had complete sway, and came to look with favor upon the teachings of Luther and Calvin, but a strong reaction occurred when Mary, who was a Catholic, ascended the throne. She exerted an unrelenting influence to re-establish Catholicism, and many of the reformed clergy escaped to the continent, while those remaining in England were persecuted as heretics or compelled to retract.

Queen Elizabeth ascended the throne in 1558 and favored the Reformation, but contentions now arose with the Puritans, who had gained many adherents during the reign of Queen Mary. The Thirty-Nine Articles, originally 42 in num-

The title of the House of Saxe-Coburg and Gotha was changed to "Windsor," July 17, 1917.

England, CHURCH OF, OF ANGLICAN CHURCH, the dominant religious body and the established church of England. It claims to be a true and apostolical church, teaching and maintaining the doctrines of the apostles. The law recognizes it as the national church and protects it in its endowments—that is, the gifts of land and tithes made

ber, but now 39, had been drawn up in 1551 under Cranmer and Ridley, and these were reviewed and revised. A convocation of the clergy accepted the amended articles and they were ratified by the queen. Parliament legalized them in 1563 and later made it compulsory for the whole clergy to subscribe to them. Together with the homilies and prayer books, they constitute a complete exposition of the tenets held at present by the Church of England on all the main points of doctrine and discipline. The Church has possession of the ancient religious edifices and the cemeteries attached to them. It is protected by law in the exercise of its right and its teaching is accepted by the state. It is one of the states of the realm and has an integral part in all legislation.

The government of the Church of England is under a system of jurisprudence made up of three elements; namely, the common law, the canon law, and the statute law. The first consists of customs and precedents; the second, of canons passed or accepted by the English synods; and the third, the acts of Parliament relating to the Church. Two archbishops, those of Canterbury and York, preside over the two provinces into which the country is divided, but the Archbishop of Canterbury is the primate of all England. The provinces are divided into dioceses, which are presided over by bishops, and those subject to them include the archdeacons, deans, canons, prebendaries, rectors, vicars, and curates. Missionary work is carried on in all parts of the civilized world. The Episcopal Church (*q.v.*) is a branch of the Church of England.

Englewood (*ĕng'g'l-wōd*), a city in Bergen County, N.J., opposite New York City. It is situated on the western slope of the Palisades of the Hudson River, on the Erie R.R., at the edge of the Hackensack valley, and is a popular residential suburb of New York City. The chief buildings include the city hall, the public library, a hospital, and the high school. Englewood was incorporated as a village in 1860 and chartered as a city in 1896. Population, 1950, 23,145.

English (*ing'glish*), WILLIAM HAYDEN, politician, born in Lexington, Ind., Aug. 27, 1882; died Feb. 7, 1896. He was graduated from Hanover Coll., Indiana, and built up a successful law practice. In 1843 he was clerk in the lower house of the Indiana legislature, and served as a Democrat in the U.S. House of Representatives in 1853-61. He was nominated for Vice President with Winfield S. Hancock in 1880, but was defeated in the election. In 1853-61 he was a regent of the Smithsonian Institution. He published "Life of George Rogers."

English Channel (*ing'glish chān'el*), an important body of water which connects the Atlantic Ocean with the North Sea and separates France from England. On its eastern end it is

connected with the Strait of Dover, where it is 21 m. wide, and at the western end it has a width of about 100 m. A strong current running eastward passes through the channel, influenced largely by the Gulf Stream, and its waters are often disturbed by storms. The Isle of Wight and the Channel Islands are within the channel. Among the English ports are Brighton, Dover, Falmouth, Plymouth, and Southampton. The French ports include Boulogne, Calais, Cherbourg, Dieppe, and Havre. Only a few athletes have succeeded in swimming across the channel, and the feat has long been a challenge to swimmers.

English Language. See *England*.

English Literature. See *England*.

Engraving (*ĕn-grāv'ing*), the art of cutting marks or figures on wood, stone, or metal. Engraving is very ancient, being mentioned in Exodus 28:36. The oldest records were cut in stone, some by making depressions and others by cutting the stone away and leaving the characters in relief. In Egypt the hieroglyphics were cut in the granite monoliths and on the walls of tombs and chambers. Later the Greeks learned the art from the Egyptians and Phoenicians. Today, however, the term "engraving" is more specifically applied to engravings made in metal for the purpose of being multiplied in print. The discovery of the practicability of taking impressions upon paper from an engraving was made by a Florentine artist named Maso Finiguerra, about 1440. In taking a cast in sulphur of some engraved church ornaments, he noted that a quantity of dust and charcoal, which had gathered in the lines of the engraving, came out upon the sulphur and gave suggestive effect. From his discovery, printing from engraved surfaces developed.

Many kinds of engravings are used in the graphic arts, varying with the purposes they are to serve. They include *line engravings* on metal plates, usually copper or steel; *etchings* on metal in which the lines are corroded by means of acid; *mezzotints*, in which there are no lines, but only shades produced by roughening the surface of the metal; and *woodcuts*. Wood engravings long preceded those made of metal.

The process of printing from engravings on wood was common in China in the 10th century, but it remained a Chinese secret for many years. The Italians and Germans attained considerable skill in engraving in the 13th century. The earliest known niello proof on paper was made in 1452. Within the three succeeding centuries the art became extremely productive under such artists as Albrecht Dürer (1471-1528), Andrea Mantegna (1431-1506), and Marcantonio Raimondi (1488-1534?), all of whom did copper engravings. Rembrandt van Rijn (*q.v.*) excelled in etchings.

All these and many other artists—of whom the great French copper engravers of the 17th

ENGRAVING

and 18th centuries, such as Jacques Callot (1592-1635), Hubert François Gravelot (1699-1773), and Claude Gillot (1673-1722) should be mentioned—considered their skill as an art and their productions as original works of art. In contrast to this conception, modern technical methods of reproducing from engraving are simply mechanical methods of reproduction.

Woodcuts were never as highly appreciated as copper engravings and etchings although prominent artists such as Albrecht Dürer and Hans Holbein the Younger (q.v.) produced beautiful works of art in this technique.

Copper is used extensively in making plates for certain kinds of engravings, especially those in which a soft metal is serviceable. The invention of steel engraving in the U.S. brought that metal into use for the finer pictures. Its greater hardness enabled it to overcome the wear of printing and made it possible to take a larger number of impressions than could be taken from a copper plate. Etchings are made by covering a prepared metallic surface with a thin coat of ground, which is not affected by acid. The design is traced with a pointed tool, which lays the metal bare wherever it touches. A wall of wax is raised around the design to hold the diluted acid, when poured on. For a copper plate this consists of five parts water and one part nitrous acid; for steel, pyroligneous acid one part, nitric acid one part, water six parts. The acid corrodes on the lines made through the ground. This is called biting in. When a sufficient depth is attained for lighter tints of the etching, the acid is removed and the surface is washed and allowed to dry. The parts of sufficient depth are now varnished and, when dry, another biting in deepens the lines not varnished, and, when deep enough for the second tint, it is removed again. This may be repeated several times, if necessary. The process of deepening the lines in this way is called rebiting. Etchings are sometimes finished by a graver and partake of the character of a line engraving. Glass may be engraved in a similar manner. Soft-ground engraving is another of the many ways of drawing the design. In mezzotint engraving the entire surface of the plate is roughened slightly, after which the drawing is traced, and then the portions intended to show high lights or middle lights are scraped or burnished, and the shadows are strengthened. Engravings so produced resemble photographs.

In photo-engraving a picture is transferred to the plate by means of photography and is then chemically treated to produce an engraved surface. The photomechanical processes of engraving have been improved materially since 1880. These include the *half-tone process* invented by Frederic E. Ives, an American, in 1881; the *line-relief process*; the *intaglio-engraving process*; and the



WORKSHOP OF COPPER-PLATE ENGRAVERS

Engraving by Abraham Bosse (1602-1676)

wax process. The half-tone is used largely in the better class of magazines; the line-relief process, for cheap newspaper illustrations; the chalk-plate, for small newspaper cuts and for U.S. weather maps; and the wax process, for making maps.

Enid (ē'nīd), county seat of Garfield County, Oklahoma, about 90 m. N.W. of Oklahoma City. It is on the Chicago, Rock Island & Pacific, the Frisco, and the Atchison, Topeka & Santa Fe R.R.'s, and is surrounded by a fertile farming region producing livestock, poultry, and dairy products. It is important as a grain storage center. The manufactures include flour, brick, clothing, processed food, and oil field and farm equipment. Enid is the seat of Phillips Univ. and of the Northern Oklahoma Hospital for feeble-minded children. It was settled and incorporated in 1893. Population, 1940, 28,081; in 1950, 36,017.

Eniwetok Atoll (ēn-i-wē'tōk ā'tōl), an isolated group of 40 islands enclosing a lagoon of 387 sq. m., belonging to the Marshall Islands (q.v.) in the central Pacific Ocean. Administered by the U.S. under a U.N. "strategic area trusteeship," Eniwetok Atoll became in 1947 the site of a proving ground for atomic energy tests and experiments conducted by the U.S. Atomic Energy Commission. At the same time 147 native inhabitants of Eniwetok were resettled on a near-by island. During World War II Eniwetok, then a Japanese mandate under the League of Nations, was a Japanese stronghold and was captured by the U.S. in 1944. See also *Atom*.

Enlightenment (ēn-lī't'n-mēt), a term signifying the great spiritual movement of the 17th and 18th centuries on which practically all later philosophical systems are based. The ideas of enlightenment are a development of the spiritual trends previously expressed in the writings of the Renaissance (q.v.). The movement of enlightenment represents an attempt to emancipate the human spirit from medieval thinking and to solve all philosophical problems by reasoning. Enlightenment therefore becomes a critical movement. In the concept of enlightenment, reason should become the absolute ruler of human life.

Enlightenment created the intellectual basis for the political movements culminating in the Ameri-

can and French Revolutions. Practically all aspects of our present-day life, e.g., religion, law, government, politics, philosophy, literature, etc., have been influenced by the philosophers of enlightenment. The decisive works of the Enlightenment were written by French philosophers. The particular forcefulness and intensity of the writings of the French philosophers may be attributed to the peculiar social conditions in France at that period, the abuse of power by the court and the clergy. Descartes' (*q.v.*) philosophical system had already laid the foundation for enlightened thinking. The outstanding personalities of the French Enlightenment are: Montesquieu (*q.v.*), Voltaire (*q.v.*), and Rousseau.

The ideas of enlightenment were outlined in the essays of the French *Encyclopédie*, published (1751-72) under the editorship of Diderot (*q.v.*) and D'Alembert (*q.v.*), in collaboration with the most important French philosophers. This encyclopedia represents not only a collection of informative articles on various subjects but also a uniform, new, and comprehensive approach toward philosophy and science. The influence of the *Encyclopédie* on the spiritual life of France and of the whole world can hardly be overemphasized.

The fundamentals of the corresponding English movement were laid by the empiricist (*q.v.*) Francis Bacon (*q.v.*). Later the philosophies of Hobbes (*q.v.*), Locke (*q.v.*), and the writings of the Earl of Shaftesbury (*q.v.*) clearly parallel the period of French enlightenment.

In Germany and The Netherlands, Leibnitz (*q.v.*) and Hugo Grotius (*q.v.*) respectively, were the forerunners of German enlightenment; Christian Wolff (*q.v.*), Lessing (*q.v.*), and Herder (*q.v.*) represented the actual philosophers of enlightenment. Judged from today's point of view, these philosophers did not differ much from the above-mentioned French philosophers, though they themselves felt great differences. In Switzerland, Pestalozzi (*q.v.*), Basedow (*q.v.*), and F.R. Wolf (*q.v.*) applied the philosophy of enlightenment to the educational field. Even Kant, the greatest German philosopher of the 18th century, may be considered a representative of German enlightenment.

In this country, the representatives of enlightenment were not so much philosophers as writers and statesmen. Benjamin Franklin, Thomas Jefferson, and Alexander Hamilton shared such ideas and their patriotic endeavors were governed by the ideals of enlightenment. It was, however, Thomas Paine (*q.v.*) whose writings had the most popular appeal.

The American enlightenment did not focus so much on philosophical abstractions as on the practical application of its basic ideas referring to government, statesmanship, and law. The American Constitution could not have been

formulated without the influence of this movement.

Ennius (*ĕn' nī-ŭs*), **QUINTUS**, Roman poet, born at Rudiae, Italy, in 239 B.C.; died in 169 B.C. He is considered the father of Latin poetry and claimed descent from a mythical hero. Little is known of his early life. He appears to have been a soldier in the Roman army, enjoying the friendship of Cato the Elder, who invited him to Rome, where he gained the friendship of Scipio Africanus the Elder. He is the author of tragedies, comedies, and a number of poems, but only fragments of his writings are now extant. His poem on Roman history, entitled "Annales," is the chief foundation of his fame.

Enoch (*ĕ'nŭk*), the son of Jared and father of Methusaleh, called "the seventh from Adam" to distinguish him from Enoch, the son of Cain, who was the third from Adam. In the Scripture it is stated that "he walked with God" and "pleased him," and it is thought that he was transported to Heaven, since we are told that "he was not, for God took him." Mention is made of him in Heb. 11:5, and in Jude 14:15. The Book of Enoch is a prophetic work mentioned in many writings of the fathers. It is apocryphal and contains 108 chapters. Jude 14 and 15 quotes from it. It is not certain when or by whom it was written, but it is generally assigned to the time of the Christian Era and was probably written in the Hebrew.

Ensilage (*ĕn'sī-lĭj*). See *Silage*.

Entablature (*ĕn-tăb'lă-tŭr*), in architecture, especially in Greek, Roman, or Renaissance architecture, a horizontal member or architecturally treated wall carried by the columns and supporting the pediment or roof plate. The entablature consists of the *architrave*, immediately above the column; the *frieze* (*q.v.*), the central space; and the *cornice*, upper projecting moldings. Originating from the primitive post-and-lintel construction, the height of the entablature in relation to the supporting column varies, in Greek architecture, with the orders, Doric, Ionic, and Corinthian. However, in general, it may be said to be about one-quarter the height of the column.

Entente (*ăn-tănt'*), French meaning agreement and understanding, especially between governments; generally with economic and commercial aims. An entente aiming at military assistance is commonly referred to as an alliance.

Entente Cordiale (*ĕord' yăl*), historic term, designating the understanding reached between France and Great Britain (1904) to follow a policy of conciliation and consultation. When Russia and Great Britain had settled their differences (1907), the Entente Cordiale, christened Triple Entente, embraced France, Great Britain, and Russia. The Triple Entente was an alliance created in opposition to the Triple Alliance (Germany, Austria-Hungary, and Italy) in order to

preserve the balance of power in Europe.

Enteric Fever (*ĕn-tĕr'ik*). See *Typhoid Fever*.

Enteritis (*ĕn-tĕr'it'is*), in medicine, an inflammation of the intestine. The whole digestive tract may be affected, causing pain, colic, dysentery, etc.

Enthalpy (*ĕn-thāl'pĭ*), the total heat of a thermodynamic system, defined as the sum of internal energy of the system and the pressure-volume product. Since enthalpy is determined by the pressure, volume, and temperature of the system, it is termed a characteristic function. In any process taking place at constant pressure the change of enthalpy is equal to the heat imparted to the system.

Entomology (*ĕn-tō-mōl'ō-jĭ*), the science which treats of insects. Aristotle called attention to one of the essential characteristics by pointing out that the bodies of insects are cut or divided into segments, from which fact their name was derived. See *Insects*.

Entozoa (*ĕn-tō-zō'ā*), the name given by Karl Asmund Rudolphi (1771-1832), a Swedish naturalist, to a class of animals living within the bodies of other animals. They are found in the intestines, liver, brain, muscles, and other tissues. According to some writers the entozoa are divided into three classes: coelmintha, or hollow worms; sterelmintha, or solid worms, as the tapeworms; and accidental parasites. Some writers treat them as equally mature and immature; the latter, inclosed in cysts, being far the most dangerous when found in inclosed cavities, as the lung or liver. See *Parasites*.

Entropy (*ĕn'trō-pĭ*), a thermodynamic quantity expressing the availability of heat energy. Absolute entropy is not easily determined, but changes in entropy are found by taking the quotient of the heat transferred by the system to its absolute temperature. Since the entropy in all natural processes remains constant or increases, the entropy of the universe is tending toward a maximum.

Envelopes (*ĕn'vĕl-ōps*), in botany, the whorls of alternated leaves designed to protect the organs of fructification from injury. In very rare cases there are none, sometimes one, though generally two—the calyx and the corolla. The name also applies to paper coverings for letters or notes that came into extensive use with the growth of the postal system. They are now shaped, folded, and gummed by machinery. A single machine of the larger type can turn out 50,000 envelopes per day.

Environment (*ĕn-vī'rūn-mĕnt*), a term used to indicate the sum of external conditions that limit or direct the activities of an individual. It is frequently used in contradistinction to the term heredity, which is the tendency possessed by an individual to resemble the ancestral stock in general characteristics, while environment in-

cludes everything which is not identified with the individual self. The subject divides itself into two kinds, the physical and the social. The former includes all the outside influences with which one may come in contact, such as climate, food conditions, the physical features of a country, the absence or presence of enemies, etc. Social environments embrace principally customs, habits, industries, religion, institutions, etc. Physical environments exercise a marked influence upon both animal and plant life, and social environments refer more particularly to the animal kingdom.

The word *environment*, in the field of education, expresses best the things which make for character by their silent influence. These mold lives from day to day by their silent impressions upon the individual. Children reared in clean and tidy homes, under the influence of moral and humane teaching, obtain a bent of desires and thoughts toward the orderly and noble. The home and the school share, perhaps, equally the responsibility of early impressions, hence the need of providing such environments as will tend to strengthen and uplift the moral and physical life of the young. Such influences, together with the part exercised through outside factors, are potent in determining the character of an individual as well as of the community in which he lives. It may be said that under primitive conditions of civilization social environments exercise a minor influence, but with the advancement of society and the enlargement of communities comes the need of exercising great care in selecting or shaping the environments with which the young may come in contact.

Enzyme (*ĕn'zĭm*), an organic material existing in organisms, living and dead, which has the property of inducing chemical changes in specific substances. Enzymes are usually of protein nature and are evidenced by their activity. For example, amylase, an enzyme derived from malt, converts starch to the sugar maltose; pepsin digests protein to produce water-soluble peptones; zymase converts sugar to alcohol. Enzyme action is responsible for nearly all biological processes.

Eoanthropus (*ĕ-ō-ān-thrō'pūs*). See *Pitldown Man*.

Eocene (*ĕ'ō-sĕn*), in geology, the first great division of the Tertiary period. It was the dawn of the present order of shells and mollusks, a few birds, reptiles, and all the invertebrate animals still living. Among the plants both endogens and dicotyledons were numerous. Man had not appeared upon the earth. The Eocene strata consist of marl, limestones, clays, and sandstones. In most cases the strata were deposited in salt or brackish waters.

Eolithic (*ĕ-ō-lith'ic*), archeological term, per-

taining to an epoch antedating the appearance of the eldest specimens of the Paleolithic period. Eolithic industry consisted largely of improvisations, or primary tools such as the hammerstone and the flint chip with utilizable sharp edge or point; secondary tools were few and simple, consisting largely of artificial chips.

Eozoic (*ē-ō-zō'ik*), the name given to rocks of the Laurentian age, in which, so far as at present known, the earliest traces of life are found.

Epect (*ē'pākt*), a number introduced into the Gregorian calendar, employed to express in days the age of the moon on Jan. 1, and thus to determine its age on Mar. 21. The Council of Nice appointed Easter Sunday to be the first Sunday after the first full moon following the vernal equinox, and this Sunday is now found by a formula. When the epect is known, it is possible to calculate the dates of all the following lunar phases throughout the year. To find the epect it is necessary to know the golden number, which is ascertained by adding 1 to the date of the year and dividing the sum by 19. The quotient is the golden number, except when the quotient is 0, when the golden number is 19. Having found the golden number, the epect of any year between 1900 and 2199 may be found by the following table. Suppose the golden number to be 15, it will be seen that the epect is 3.

GOLDEN NUMBER	EPECT	GOLDEN NUMBER	EPECT
1	29	11	19
2	10	12	30
3	21	13	11
4	2	14	22
5	13	15	3
6	24	16	14
7	5	17	25
8	16	18	6
9	27	19	17
10	8		

Epaminondas (*ē-pām-ī-nōn'dās*), Theban general and statesman, born about 418 B.C.; died in Mantinea, Arcadia, Greece, 362 B.C. He came from a noble family and received his education from Lysis, a follower of Pythagoras. He remained aloof from politics until he was 40 years of age. Then, in 379, he and Pelopidas (*q.v.*) led the Theban patriots in the expulsion of the Spartans, who had taken possession of the city of Thebes early in the 4th century. Epaminondas' leadership subsequently raised Thebes to the summit of power and prosperity among the Greek city-states. When he was sent to Sparta in 371, his firmness prevented the conclusion of a peace treaty. War was resumed and he was placed at the head of the Thebans. Four times he suc-

cessfully invaded the Peloponnesus, but, when complete victory was finally in his grasp, he was mortally wounded by a javelin. The ancients extolled the justice and moral purity of Epaminondas as much as his military talent, and it is said of him that he never deviated from the truth.

Épée (*ā-pā'*), a blunt-edged sword with a sharp point formerly used in dueling, and employed today in fencing (*q.v.*).

Ephesus (*ē'fē-sūs*), an ancient city of Asia Minor, situated in Lydia, near the mouth of the Cayster River. One of the 12 Ionian cities founded by the Greeks, it was regarded as sacred from an early period although it did not become important until some time after the Trojan War. It passed successively under the possession of the Lydians, Persians, Greeks, and Romans. In the time of Augustus it attained its greatest importance as a trade center, and was for three years the residence of St. Paul, who afterward wrote his "Epistle to the Ephesians," while in prison at Rome, to the church at Ephesus. In 262 A.D. the Goths so plundered the city that it never again recovered its importance. The third Ecumenical Council of the Christian Church was held at Ephesus in 431, at which resolutions condemning the Nestorians (*q.v.*) were passed.

The famous Temple of Diana (who was called Artemis in Greek, and whose temple was therefore called Artemision), which was counted among the seven wonders of the world, was located a mile east of the city on the site of the present-day village of Aya Soluk.

Built about 650 B.C., and completed after 120 years, this 128-column structure was 225 ft. wide and 423 ft. long. It contained statues and pictures by the most noted Grecian masters. Burned by Herostratus (356) it was rebuilt, but Nero robbed it of its treasures and the Goths burned it. Theodosius I finally ordered its destruction in 381 in an edict against pagan worship. After numerous excavations, the site of the temple was discovered in 1869, and many interesting remains were found. See also color plate *Seven Wonders of the World* in Volume X.

Ephod (*ē'fōd*), in the Old Testament, the rich dress of the Jewish high priest as described in detail in Exodus 28:6 ff. The same word is used to mean "image" in the Book of Judges 17:5.

Ephraim (*ē'frā-īm*), the younger son of Joseph, the founder of the tribe of Ephraim. The Ephraimites occupied a fruitful district in north central Palestine. Their lands included most of the province afterward called Samaria. Within it were many places of historical interest, such as Shechem, with the tomb of the tribal ancestor, and the final resting place of Joshua. For a long time the tribe of Ephraim was in possession of the ark and the tabernacle at Shiloh.

Epic Poetry (*ē'pīe pō'et-rī*), or *EPÓS*, the lit-

erary name given to the most dignified form of narrative poetry, usually dealing with war, religion, or romance on an ideal and universal plane. Specifically, it may relate the fortunes of a hero or of a people and reflect the life and attitudes of a period, but the whole action is raised to a sublime and impersonal level. The traditional epic poem represents the beginning of a definite literary style. It developed out of folklore, a mass of legendary and historic thought handed down orally through the centuries in epic songs which were spontaneously composed and adapted and readapted by minstrels. The traditional epic poem is almost always anonymous, and there are many theories as to the manner in which the epic songs were arranged and written down to form a coherent epic poem. The metric forms of the various epics differ with each country and the period of their origin.

This type of poetry occurs in the literature of almost all civilized peoples. The finest of the early traditional epic poems were the Greek "Iliad" and "Odyssey," attributed to Homer, which remain the classic standards for all secondary epic poems. Other traditional poems of an epical character are the Anglo-Saxon "Beowulf," the German "Nibelungenlied," the Icelandic "Edda," the French "Chanson de Roland," and the Spanish "Cid."

After the traditional epic poem, a great many secondary, or imitative, epic poems were written in conscious literary form by poets. Although many of these were mere creations of scholarly minds and lacked the vitality of the classic examples, some others are among the great literary treasures of all time. For example, Vergil's "Aeneid," which owed much in form and content to the Homeric tradition, and Dante's "Divina Commedia," in which the figure of Vergil appears, are immortal poetic creations.

At the beginning of the Renaissance a great number of poets began to compete for the laurels of Dante. The best known of their works were Lodovico Ariosto's "Orlando Furioso" (1516), "Jerusalem Delivered," by Torquato Tasso (1580), and the "Lusiad," by the Portuguese poet, Camoëns (1572). In England, Spenser's "Faerie Queene" (1590), and Milton's "Paradise Lost" (1667), are magnificent examples of the epic poem in a somewhat later period.

It is almost impossible to find a gauge for the evaluation of epic poems of the past. Some of them, like the Homeric poems or the 11th-century "Chanson de Roland," possess a timeless vitality and are interesting and pleasing to the reader in any period. Others, particularly the epical creations of the 15th and 16th centuries, present greater difficulties because they are weighted with topical allusions and given over to complicated action.

It is characteristic of the epic poem that a certain amount of pomp and circumstance is always used to glorify the deeds of the heroes or demigods. Battles, duels, banquets, love scenes, etc., are described in minute detail. Mythological references and allegorical representations of divine personages, pagan or Christian, may also be employed in the epic to establish the action in a sphere above common human experience. Individual emotional values receive little attention. Words and gestures provide a descriptive expression of the emotions, but do not convey the emotions themselves, as they do, for example, in lyrical poetry. The greatness of the Homeric epics, of Vergil, of Dante, and Milton may be partially attributed to the fact that the individual human characters are molded clearly within the narration. Of such overwhelming power was their poetic image of men and heroic deeds that many centuries later artists were still attempting to portray them in visual form. Only the Bible has stimulated the fine arts through the ages as strongly as the great epic poems.

Epictetus (*ēp-ī-kē-tūs*), Greek Stoic philosopher, born in Hierapolis, in Phrygia, about 90 A.D.; died about 94 A.D. His early life was spent as a slave at Rome, where he became a nominal Stoic. After attaining his freedom, he studied philosophy, was driven into exile by Emperor Domitian, and settled in Nicopolis, in Epirus, near the scene of the Battle of Actium. His maxims were collected by his pupil, Arrian, and published in a work called "Encheiridion," meaning handbook, and a number of "Commentaries." The works still extant show an earnestness and nobility of character rarely surpassed. Among his teachings may be enumerated the theory that education lies in learning to wish things to be as they really are, and in acquiring ability to distinguish our own from the possessions of others. In other words, the sole true cause of our acting lies in our opinions and judgments, under the direction of a will.

Epicureanism (*ēp-ī-kū-rē-an-iz'm*). See *Epicurus*.

Epicurus (*ēp-ī-kū-rūs*), famous Greek philosopher, born on the island of Samos in 342 B.C.; died in 270 B.C. From his native village, probably on the island of Samos, he went to Athens and finally settled down in Mytilene to teach philosophy. Through his teaching, which he later on continued in a garden in Athens, he gained tremendous influence, far stronger than that of Democritus (*q.v.*), the philosopher through whom he had been influenced originally. Epicurus is believed to have written 300 volumes, of which only fragments are extant. Most of what we know about him we learn from quotations in later Greek and Roman writers. His philosophy, known as "Epicureanism," does not pertain to an inter-

est in the material pleasures of life only, as is the common misconception. Epicureanism means a search for happiness composed of a blending of intellectual, emotional, and esthetic pleasures. In Epicurus' opinion, these pleasures are superior to those derived from material things because they can be controlled more easily. His concept of nature is almost identical with Democritus' "Atomism" (*q.v.*).

Epidemic (*ĕp-ĭ-dĕm'ik*), a disease which attacks many persons at the same time, spreading suddenly, often extremely virulent and fatal at first, then gradually becoming spent and feeble, so that the earliest stages are usually the worst. The plague, cholera, influenza, and la grippe are epidemics, while scarlet fever, typhoid fever, smallpox, diphtheria, and chickenpox are usually so regarded. However, some of these are classed more generally as contagious diseases. All that can be said with certainty about epidemics is that at the beginning there must be some distempered conditions around us, and our systems be predisposed to the reception of the specific poison, which causes the disease.

Epidermis (*ĕp-ĭ-dĕr'mis*), in anatomy, the cuticle or scarfskin, constituting the external layer of the skin and protecting inner ones. In man it is thickest on the palms of the hands and soles of the feet. It possesses an organized structure, but has no nerves or blood vessels. The outermost layer of cells covering the surface of plants, when there are several layers of tissue, is also called epidermis.

Epididymis (*ĕp-ĭ-dĭd'y-mis*), in anatomy, a tube which lies above the testicle and conveys the fluid sperm to the *vas deferens*, thus insuring proper ejaculation.

Epigram (*ĕp'ĭ-grām*), a name given by the Greeks to a poetic inscription on a public monument. It was applied originally to a short verse or poem having only one subject, and was finished by a witty or ingenious turn, but is now applied to any short composition expressed neatly and happily, as "The child is father of the man."

Epilepsy (*ĕp'ĭ-lĕp-sy*), or FALLING SICKNESS, a disease which derives its name from the suddenness of the attack. Usually the patient becomes unconscious and falls to the ground convulsed, turgid, and livid. This condition is generally accompanied by frothing at the mouth, a choking sound in the windpipe, biting of the tongue, and a suffocating tendency. After the patient reaches an exhausted, comatose condition, life is no longer in danger. Epilepsy is of uncertain etiology, but attacks may be caused by fear, passion, or an injury to the brain. The last-named type is termed Jacksonian epilepsy. In severe cases there is little hope of a cure, but patients may be afflicted with it from childhood until old age. Children often outgrow it at the period of adolescence.

Epileptics (*ĕp-ĭ-lĕp'tiks*), persons afflicted with epilepsy (*q.v.*).

Epiphany (*ĕ-pĭf'ā-nŷ*), a festival of the Christian church, instituted to commemorate the visit of the Magi or wise men to the infant Jesus Christ, for whom they brought presents from the East. It is celebrated on Jan. 6 and is sometimes termed the *manifestation of Christ to the Gentiles*.

Epiphysis (*ĕ-pĭf'y-sis*), in medicine, the end of a bone while the latter is still in the process of growing. It is first attached to the rest of the bone by cartilage, which later hardens and becomes bone itself.

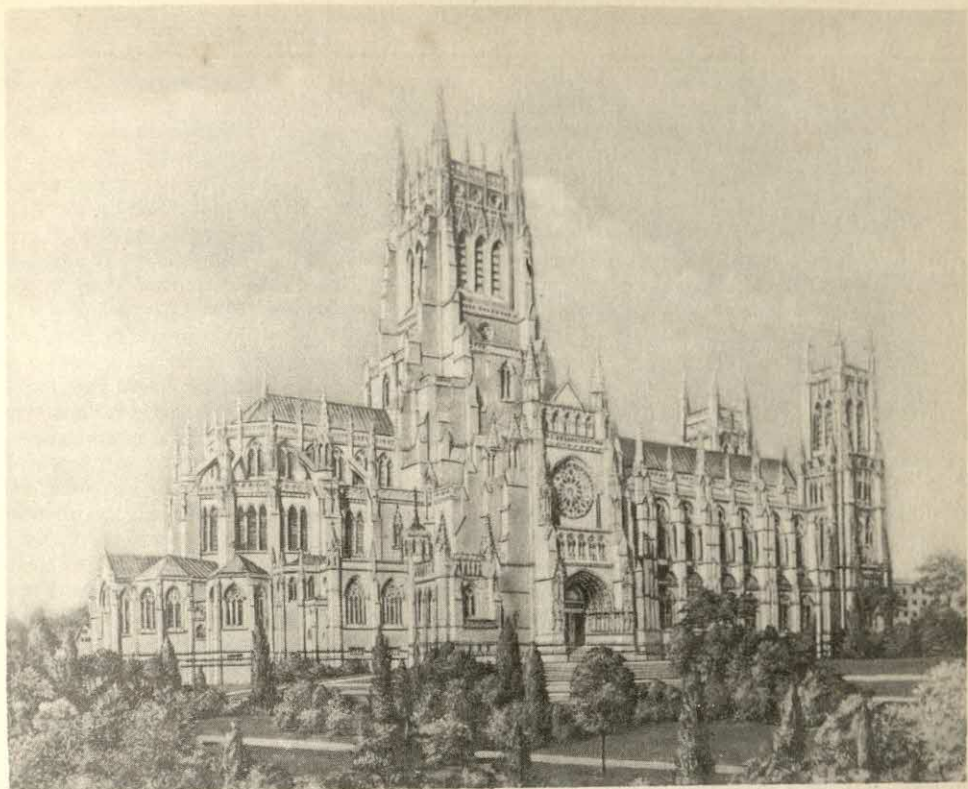
Epiphysis Cerebri (*sĕ-rĕ'brĕ*), in medicine, name of the pineal gland.

Epirus (*ĕ-pĭ'rŭs*), a country of ancient Greece, surrounded by Illyria, the Ambracian Gulf, the Pindus Mts., and the Ionian Sea. Among the interesting towns were Donoa and Ambracia. The region was noted for its supply of heavy timber and the production of corn and domestic animals. Among the people were several colonies, the Grecians proper occupying largely the southern coastal district. Pyrrhus was the most celebrated king of Epirus and long waged war upon the Romans, but it finally became a province of Rome in 168 B.C. To prevent further insurrections the Romans plundered the country, razed 70 towns, and sold 150,000 of the people into slavery. It shared in the fortunes of the Roman and the Byzantine Empires for many centuries, and was conquered by the Turks in the 15th century. Since the 14th century a large percentage of the inhabitants has been made up of Albanians. A small strip of land situated east of the Arta River was ceded by Turkey to Greece in 1881, along with most of Thessaly.

Episcopal Church (*ĕ-pĭs'kō-pāl*), or PROTESTANT EPISCOPAL CHURCH, a Christian denomination, the American branch of the Church of England.

The Church of England came into existence when after 12 centuries English churchmen found it desirable to resist encroachments and claims of the papacy, and finally refused to tolerate them. Communion between the English Church and the papacy was broken in the 16th century. This was a reform from within, which in no way interrupted the continuity of the church or broke any of its connecting links with the earliest days.

All this accounts for the fact, which puzzles some people, that the Episcopal Church is simultaneously catholic and protestant, primitive and reformed. It is catholic and primitive in that it has preserved the faith and order which in the early days was taught everywhere; the threefold ministry of bishops, priests, and deacons; the sacraments of baptism and the Holy Communion; the creeds, as the brief record of facts on which the church is based; and the Holy Scriptures. It



Courtesy Hawkes Studio, N. Y.

CATHEDRAL OF ST. JOHN THE DIVINE

This structure of the Episcopal church in New York City has been under construction for the last four decades. When completed, it will be the largest church in the Americas

is protestant and reformed in that it did away with what it considered certain abuses of the Middle Ages, and to this day it protests the error of what it holds to be unwarranted additions and unscriptural developments.

When English colonists came to what is now the U.S. they brought the church with them and organized its temporal affairs at the same time that the government was taking form. Many of the country's statesmen were churchmen, and the governments of church and state have many similarities, notably in their legislative bodies, with two houses. That of the Episcopal Church is called its general convention and has a House of Bishops and a House of Clerical and Lay Deputies; it meets every three years.

Missionaries sent by the English "Society for the Propagation of the Gospel in Foreign Parts" were responsible for much of the work of the church in the colonies. The Episcopal Church held its first general convention in Philadelphia in 1785.

It adheres strictly to the doctrine, discipline, and worship of the mother church, but the prayer book is altered so as to be consistent with the

changes in the political condition of the country. Little progress was made in extension work until 1811, and within a period of 10 years churches were organized in 13 of the states. A movement toward suppressing the outward developments of what is known as ritualism caused extended controversies, especially in the general conventions of 1868 and 1874, and the two factions came to be known as the *low church* and the *high church parties*. Those opposing the ritual belong to the former, but the high churchmen are the dominant influence. The *Reformed Episcopal Church*, which was founded as an outgrowth of these controversies in 1873, professed to follow the genuine principles of the Anglican Church as they were propounded at the time of the Reformation. Generally, the leading principles are almost identical with those of the Protestant Episcopal Church. This denomination now has about 25,000 members and 80 churches.

Changes in the prayer book or the constitution of the church can be made only by the general conference.

The Episcopal Church is both conservative and liberal. Its "Book of Common Prayer" sets forth

its services not according to any one individual opinion but by the continually studied and tested judgment of the church as a whole. Believing that the Christian life should neither neglect nor overemphasize any one aspect of Christian teaching, the Episcopal Church through the prayer book observes the Christian year, calling attention in turn to each of the great events of Jesus' life and to His teachings.

Teaching the sacramental principle that all physical matter is the instrument of spirit, the church believes that spiritual healing is a natural part of its ministry.

The American Protestant Episcopal Church comprises more than 1,500,000 communicants, 150 bishops, and over 6,000 other clergy. Among its educational activities is the maintenance of about 20 colleges and theological seminaries.

Foreign missionary work began in the Episcopal Church about 1835, and now there are more missionary bishops overseas than were in the U.S. 100 years ago. In China and Japan the American bishops joined with English, Canadian, Chinese, and Japanese bishops to establish autonomous or national churches in those lands.

The Episcopal Church's missionary work at home and abroad, and its national social service and religious education, are organized as part of a national council with headquarters at the Church Missions House, 281 4th Avenue, New York City. The mission staff includes about 250 Americans and 2,000 native workers in foreign fields, and nearly 500 in continental U.S. who are wholly or in part supported by national council funds. Hundreds more are supported locally.

Among the organizations to promote Christian and charitable work are the Brotherhood of St. Andrew, the Daughters of the King, the Church Temperance Society, and the Foreign and Domestic Missionary Society.

Epistaxis (*ēp-i-stāk-s'is*), in medicine, bleeding from the nose. It is frequently caused by exhaustion or any kind of exertion which affects the heart. It is sometimes a symptom of high blood pressure.

Epistemology (*ē-pis-tē-mōl'ō-gy*), or theory of knowledge, is that branch of philosophy which studies the sources, limits, methods, and validity of knowledge. Early in the history of thought men were impressed by the apparent deceptions which their senses sometimes played on them, and also by the fact that they were often led to adopt conflicting, erroneous, and even absurd beliefs by following what seemed otherwise to be correct processes of thought. Skeptical views were therefore frequently held concerning the very possibility of genuine knowledge, and already in ancient Greece philosophers (such as Plato and Aristotle) began to investigate the nature of knowledge in order to meet such doubts.

But epistemology was not recognized as a distinct branch of philosophy until modern times. The development of the natural sciences in the 17th century helped to bring about a sharp cleavage between the world as it appeared to common sense and the world as described by the new physics. Thoughtful men began to wonder seriously what part of their supposed knowledge they could trust. John Locke's famous "Essay on the Human Understanding" (published in 1689) was perhaps the most influential single book which directed men's attention to the importance of epistemological problems. The way it formulated those problems determined in large measure the course of epistemological inquiry for several centuries. Locke noted that previous thinkers had tried to answer fundamental questions about the universe, but offered contradictory solutions to them. He suggested that these past failures arose because men had taken a wrong course; they tried, mistakenly according to Locke, to discover the nature of the world before first inquiring into their own intellectual powers "to see what objects our understandings were or were not fitted to deal with." Locke therefore proposed to examine the origins, certainty, and extent of human knowledge, together with the grounds and degrees of belief, opinion, and assent.

A great deal of modern philosophy, even when it has not accepted Locke's special views on the powers of the human mind, has followed him in maintaining that the limits of knowledge must first be determined before men could safely investigate the constitution of the universe. A century after Locke, Immanuel Kant's "Critique of Pure Reason" (published in 1781) reaffirmed Locke's basic assumption, and initiated the influential "Critical Philosophy" which attempted to fix once for all the sources of the extent of human understanding. Before long, however, what was thus claimed to be the limits of knowledge were rapidly exceeded by the developing natural sciences, and a reaction among philosophers against the primacy of epistemology set in. In fact, a considerable section of contemporary philosophy has come to the conclusion that the central preoccupation of traditional epistemology is a mistaken one, and involves an absurd problem. Many thinkers now argue that the assumption that one must first discover what are the powers of the human mind before using it to explore the universe is as reasonable as the refusal of a man to enter the water until he has learned how to swim. However, while a good proportion of philosophers no longer concern themselves with epistemology as Locke and Kant conceived it, they do devote much effort to analyzing critically the basic assumptions involved in the methods and concepts of the various special sciences. What is now often called the philosophy of science has thus replaced

the epistemological inquiries of the early modern philosophers.

Epistemology includes the study of a number of distinct though related problems, and many of the characteristic oppositions between philosophical schools arise from the way in which these questions are analyzed and answered. The following classification of problems is a convenient and standard one:

The sources and methods of knowledge. Several types of answers have been given to the question from whence comes our knowledge and by what means is it achieved: According to *rationalism* (q.v.), abstract reason or logic is the primary source of genuine knowledge and intellectual certainty, and deduction from self-evident first principles (such as the axioms of geometry were once believed to be) is the most assured method for acquiring them. *Empiricism* (q.v.) maintains that all knowledge about matters of fact is derived from experience, whether the experience is obtained through the organs of sense or is supplied by introspection as well; and only repeated exposure to experience and the use of inductive procedures, rather than reliance on the rules of formal logic, can lead to reliable knowledge. *Mysticism* (q.v.) holds that ordinary experience and logical reasoning are illusory, and claims that genuine truth can be attained only by means of a supersensuous and supra-rational faculty of intuition. *Critical idealism*, as developed by Kant, attempts to resolve the conflicting claims of rationalism and empiricism; it maintains that the mind interprets experience in terms of a set of fixed forms which are not derived from experience, but that these forms do not constitute knowledge until they are filled by the matter supplied by experience. *Pragmatism* (q.v.) and *positivism* (q.v.) also deny that there is an unbridgable gulf between reason and experience, but they reject the Kantian assumption that the mind brings to experience a set of unalterable forms. These philosophies maintain that the deductive-experimental method of the natural sciences, according to which the logical consequences of tentatively entertained hypotheses must be experimentally verified, is the most assured way for attaining knowledge of matters of fact.

The limits and validity of knowledge. Whether knowledge is at all possible, and if so what its bounds are, are questions that have been answered in diverse ways. Some of the ancient skeptics either denied that human beings possess genuine knowledge, or maintained that at best such knowledge is restricted to things of which a man is directly aware. In modern times, *epistemological dualists* such as Locke have argued that the immediate objects of knowledge are the subjective states of the individual mind, and have thus made the existence of the external world problematical.

Solipsists have drawn the further consequence that belief in the external world is a blind act of faith, and that the existence of the individual knower and his mental states constitute the sole objects of assured knowledge. *Critical idealists*, following Kant, maintain that scientific knowledge is possible only of the phenomenal world (that is, the world presented to inner or outer sense), and deny that such things as God, freedom, and immortality can be anything but objects of faith. Contemporary *positivists* hold that only what is verifiable in sense experience is meaningful and knowable, and thus dismiss many of the traditional philosophical problems concerning man and the universe as meaningless.

The nature of truth. Several distinctive answers have been proposed to the question of what it means for a proposition to be true. According to the *correspondence theory of truth*, a proposition is true only if it corresponds to, or in some way resembles, the objects of which it is a representative. According to the *coherence theory*, a proposition is true only if it is consistent with the inclusive system of propositions about reality. According to the *pragmatic theory*, a proposition is true only if it serves as a successful plan of action.

The nature of the objects of knowledge. Many philosophers have tried to show that the basic nature of what is known can be determined from the study of human knowledge. *Idealists* (q.v.) in philosophy have in general maintained that the existence of all things in some way depends on the existence of minds (whether human or divine), and that the objects of knowledge must be similar in certain fundamental respects to the minds that know them. Idealists have therefore concluded that the substance of the world must at bottom be mental or spiritual in character. *Realists* (q.v.) in philosophy, on the other hand, deny that there is in general any dependence of what is known upon the act of knowing. They thus maintain that the world contains not only such familiar things as stars, tables, and atoms, which continue to exist quite independently of any intelligence, but also abstract objects such as numbers which are studied in mathematics. See *Aesthetics*.

Epitaph (*ēp'ī-tāf*), an inscription upon a tomb or monument in honor or memory of the dead. The Egyptians first used epitaphs, usually with some prayer to Anubis or Osiris, and a similar custom was in vogue among the Greeks and Romans. Subsequently the practice became general throughout the Christian nations. The usual characteristic features in modern epitaphs are the name, date of birth and death, and some sentiment or expression of faith or affection. In many cases the sentiment is a quotation from the Bible, though epitaphs exemplify every variety of sense

and taste, from lofty pathos to the vilest scurrility. Curious as it may seem, books containing collections of epitaphs are among the most amusing.

Epithelium (*ĕp-i-thē'li-ŭm*), the layer of cells which lines the internal surfaces of the body, being continuous with the epidermis, which covers the external surface of the skin. Its main function is to act as a covering for the soft and moist surfaces that secrete the various fluids of the body. It lines the entire respiratory tract and the alimentary canal, and forms essential elements in the true glands, such as the pancreas and liver. The ciliated epithelium has hairlike projections known as cilia (*q.v.*), which have a continuous vibratory motion. Epithelium of this kind is found in the bronchial tubes, the air passages, the eustachian tube, and the lachrymal appendages.

Epizoa (*ĕp-i-zō'ā*), the name given to parasitic animals which live upon the external surface of other animals, such as lice, itch insect, etc. See *Parasites*.

Epizootic (*ĕp-i-zō-ōt'ic*), an epidemic disease among animals. It is usually mispronounced in America as *ep-i-zoo-tic*. The very fatal contagious catarrhal fever which raged throughout the country in 1870 and at different times since was a form of the disease. Thousands of horses and cattle died at that time. Some pathologists claim to trace a connection between this disease and la grippe. See *Influenza*.

E Pluribus Unum (*ĕ plū'ri-būs ū'nūm*), meaning one out of many, the national motto of the U.S. Adams, Franklin, and Jefferson were a committee to prepare a seal and proposed this motto, which was adopted on July 4, 1776.

Epoch (*ĕp'ōk*), or ERA, a point in the course of history from which preceding and ensuing years are computed. The creation of the world and the birth of Christ are the most important epochs, and on the former are based many notable chronologies. The *Era of Creation* is placed by Catholics and Protestants at 4004 B.C., the *Era of Constantinople* at 5508 B.C., the *Era of Antioch* at 5502 B.C., and the *Era of Alexandria* at 5492 B.C. In Jewish writings the creation is placed at 3760 B.C., on which the Jews base their era. The *Christian Era*, a mode of computing time from the birth of Christ, went into extensive use among Europeans about the year 1000, though it was introduced in the 6th century. The event of Christ's birth took place four years earlier than the date written in our calendar. The *Julian Epoch* begins with 4713 and is based on the coincidence of the lunar, solar, and indictional periods. Mohammedans compute time from July 16, 622, the date of the *Hegira* of Mohammed. Among the Chinese it is customary to compute time by cycles of 60 years, and to apply a different name to every cycle.

Epping Forest (*ĕp'ing fōr'ĕst*), a pleasure re-

sort near London, England. It comprises 5,600 acres of magnificent woodland, rises 760 ft. above sea level, and is improved by many structures and conveniences. It was once a portion of the hunting ground of the kings, and constituted a part of the forest that covered all of Essex. The crowded populations of London utilize this resort extensively for pleasure walking and driving.

Epsom Salt (*ĕp'sŭm sŏlt*), or MAGNESIUM SULPHATE, a cathartic salt, so named because it was first obtained from the famous mineral springs of Epsom, a market town of England. It is soluble in water and is used as a purgative. This salt is obtained by an artificial process from magnesian limestone, the latter being treated with sulphuric acid, or by dissolving it in boiling water and allowing the insoluble matter to settle. Afterward the water is evaporated from the solution, leaving the salt.

Epstein (*ĕp'stēn*), SIR JACOB, sculptor, born in New York City in 1880; died in London, England, Aug. 21, 1959. He studied in New York City and in Paris, settled in London in 1905, became a British citizen in 1910, and was knighted in 1954. His works, principally of bronze and marble and characterized by strong naturalism, were often controversial, and include a marble tomb for Oscar Wilde (1909); "*Ecce Homo*," an 11-ft. statue of Christ (1933); and a 3-ton alabaster figure, "*Adam*" (1939).

BRONZE BUST BY SIR JACOB EPSTEIN

Portrait of Oriol Ross

Courtesy Museum of Modern Art, N. Y.



Epworth League (*ēp'wūth lēg*), a young people's religious society of the Methodist Episcopal Church, organized in 1889. In 1940, however, it was reorganized as the *Methodist Youth Fellowship*, which now has about 1,500,000 members in over 40,000 churches. The name Epworth League is still used in some churches to refer to Sunday evening meetings of the main organization. The chapters are classed as *senior* and *junior*, about one-fourth of the members belonging to the latter class. The object is to promote an earnest, practical, intelligent, and loyal spiritual life in the young people of the church, and corresponds to societies maintained for similar purposes by the Baptist, Lutheran, Catholic, Presbyterian, and other churches. It is the largest denominational society in the world. *Highroad* is the official organ.

Equation (*ē-kwā'shūn*), an expression of equality between two quantities, called the members of the equation. Identical equations, often briefly called *identities*, are equations in which the members are equal for all values of the variables that appear in them. Sometimes an identical equation is indicated by writing the sign of equality as $\equiv$. Conditional equations are equations in which the members are equal for certain values of the variables appearing in them. For example, the members of the equation $x + 1 = 3$ are equal if $x = 2$. When not otherwise specified, the word equation means a conditional equation.

Equations are classified by the number of variables appearing in them and by degree. Equations of the first degree are often called linear equations, because the graph of a first-degree equation in two variables is a straight line. Equations of the second degree are called quadratic, those of the third degree are called cubic, those of the fourth degree are called quartic, etc.

The problem of determining the values of the variables, called the *roots*, or the *solutions*, of the equation, that will satisfy the equation—that is, make both members equal—is one of the most important problems of algebra. In its simplest form this problem may be approached in an arithmetical way. Thus, to find the solution of the equation $x + 1 = 3$, we may look upon the equation as asking the question: what is the number such that, if 1 is added to it, the sum will be 3? To find the solutions of more involved equations it is more convenient to use the basic properties of equalities, the axioms of equality. They may be combined into one statement: If equals are added to, subtracted from, multiplied by, or divided by equals, the results are equal. (It is understood here, as elsewhere, that division by zero must be excluded.) Following a more formal method, the solution of the equation $x + 1 = 3$ may be found by subtracting 1 from each member of the equation, again giving $x = 2$.

Since the values of the variables which will satisfy an equation are unknown when the problem is stated, the problem of solving an equation is that of finding these unknown values.

Methods for finding the solution of equations of the first, second, third, and fourth degrees in one variable have been known since 1545. Linear equations can be solved so readily that a formula is hardly necessary. Quadratic equations can always be expressed in the form $ax^2 + bx + c = 0$ and the solutions of this general quadratic equation

$$\text{are given by the formula } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

The solutions of the general cubic and quartic equations were discovered by Tartaglia and Ferrari in 1541 and 1545. Stimulated by their success, others made many attempts to solve the general fifth-degree equation. They were all doomed to fail, however, for Niels Henrik Abel (1802-29) showed that the solution of general equations of the fifth and of higher degrees could not be found in terms of radicals.

An equation involving more than one variable usually has more than one solution. Thus, the equation $x + y = 5$ has as its solutions all pairs of numbers whose sum is 5, for example: 1, 4; 2, 3; $\frac{1}{2}$, $4\frac{1}{2}$; $2\frac{1}{2}$, $2\frac{1}{2}$; $1 + \sqrt{2}$, $4 - \sqrt{2}$; etc. If we seek a solution that not only satisfies the equation $x + y = 5$, but, at the same time, satisfies the equation $x - y = 1$, we find that only one pair of numbers that satisfies $x + y = 5$ also satisfies $x - y = 1$, namely $x = 3$, $y = 2$. Such a solution which satisfies both equations is called their *simultaneous solution* and the equations are called *simultaneous equations*. The most important cases of simultaneous equations are simultaneous equations of the first degree in which the number of equations is the same as the number of variables. In these cases the solution is usually a single set of values of the variables. The solution of such simultaneous equations can be expressed conveniently by means of determinants.

Equator (*ē-kwā'tēr*), the great circle imagined drawn around the earth midway between the Poles, and which divides it into the Northern and Southern Hemispheres. The distance from it to the Poles is 90° . It forms the basis for measuring the latitude of places both north and south. Twice in the year, on Sept. 21 and Mar. 21, when the rays of the sun shine vertically on the Equator, the days and nights are equal all over the earth, from which the name *equinox* (*q.v.*) has been derived. At the magnetic Equator, which is midway between the North and South magnetic poles, a magnetic dip needle is horizontal. As the magnetic poles are neared the dip of the needle increases. At each of the magnetic poles it points vertically downward. Lines connecting places

which have the same angle of dip are called isoclinal lines.

Equatorial Telescope (*ĕ-kwà-tō'ri-ql tēl'ē-skōp*), an instrument mounted upon a fixed axis parallel to the axis of the earth, which renders its motion parallel to the plane of the equator. The telescope turns upon a second movable axis, making it possible to locate by right ascension and declination all heavenly bodies. Most equatorial telescopes revolve round the polar axis by an attached clockwork, which may be regulated to vary the velocity of rotation to meet the requirement in examining a particular heavenly body, such as a planet, a fixed star, a satellite, or the sun.

Equerry (*ĕk'wēr-i*), an officer of princes or nobles, who is charged with the care of their horses. In England such officers are members of the royal household.

Equestrian Order (*ĕ-kwēs'trī-qn ōr'dēr*), or *EQUITES*, an order of the people in ancient Rome. Originally they were a military organization and formed the cavalry of the army. Livy attributed their origin to Romulus, who is said to have selected the first 300 out of the three chief divisions of the patricians. They were divided into *turmo*s of 30 men each and again subdivided into 10, and in wartime were obliged to serve on horseback. The *equites* continued as an exclusively military body until 123 B.C., when a law was enacted that required the jurors (*judices*) be selected from them. In addition they enjoyed the privileges of officiating as *publicani*, or farmers, of the public revenues. They wore a gold ring and a robe with a narrow purple border to distinguish them. During the republic they exercised much influence, but disappeared from political life under the later emperors.

Equilibrium (*ĕ-kwī-līb'rī-ūm*), a condition applying to a rigid body for which the total force as well as the total torque around any axis is zero. The equilibrium condition implies that the rigid body will be at rest or moving with constant speed. The equilibrium of a body acted upon by gravity depends upon the position of the center of gravity with respect to the point of support. Thus a cone resting upon its base is in stable equilibrium, but when resting upon its apex it is in unstable equilibrium.

Equinox (*ĕ'qwī-nōks*), the time at which the sun, in passing the Equator, renders the days and nights of equal length over the entire earth. This occurs when it passes one of the *equinoctial points*, the two equinoctial points being where the ecliptic and celestial equators intersect each other. The *vernal equinox* occurs on Mar. 21, when the sun is in the first part of Aries, and the *autumnal equinox* takes place on Sept. 21, when it is at the first of Libra. At all other times of the year the lengths of day and night are unequal, the greatest difference occurring at the Poles. After

the vernal equinox, the sun passes from south to north, causing the days to lengthen in the Northern Hemisphere; while, after the autumnal equinox, it passes from north to south, causing the days to shorten in the Northern, but lengthen in the Southern Hemisphere. The precession (*q.v.*) of the equinoxes is due to the equinoctial points moving westward at the rate of 50" in a year. The equinoxes, in March and September, are accompanied by gales known as *equinoctial storms*, which are most severe on the Atlantic coasts of America and Europe.

Equisetum (*ĕk-wī-sē'tūm*), a flowerless plant with a creeping rootstock from which vertical stems rise. The leaves are small and arranged in whorls. They grow best in moist soil in temperate climates.

Equity (*ĕk'wī-tī*), in law, a particular system of jurisprudence, which is based upon justice rather than precedent. It is sometimes defined as natural justice to distinguish it from the fixed and technical rules of law. In some countries, as in England, equity is administered by courts of chancery, but in some states the cases in equity are referred to the courts of law. The aim is to extend relief in causes which are not recognized in a strict sense by the law, hence the decisions are based upon modifying circumstances rather than upon the statutory law. Usually the plaintiff and defendant state their claim and defense in a formal statement, which is termed *pleading*, and the question raised in this way constitutes the *issue*. In some instances the issues of fact are disposed of by the judge and jury, while in some countries the cases in equity are tried only to the court. In general, it may be said that courts of equity serve to bring all parties interested in a cause before the tribunal and adjust the rights of the several parties according to the circumstances which bear upon the issues.

Equivalent (*ĕ-kwīv'q-lēnt*), in chemistry, the weight in grams of an element which will combine with or displace one gram atomic weight of hydrogen.

Erastistratus (*ēr-ā-sīs'trā-tūs*), Greek physician, born at Iulis, in the island of Ceos, about 325 B.C. He was a pupil of Theophrastus and practiced for many years at Alexandria, Egypt, where he founded a school. The latter part of his life seems to have been spent at Samos in the study of anatomy. He was the first to distinguish between the motor nerves and the sensory nerves, and published a reasonably accurate description of the brain. In his writings he expressed the view that the veins and arteries have their origin in the heart, thus approaching the discovery of the circulation of the blood.

Erasmus (*ēr-rāz'mūs*), *DESIDERIUS*, philosopher and scholar, born in Rotterdam, Holland, Oct. 28, 1467; died in Basel, Switzerland, July 12, 1536.



Courtesy Metropolitan Museum of Art, N. Y.

ERASMUS OF ROTTERDAM

Engraving by Albrecht Dürer (1471-1528)

His name properly is Gerhard, meaning loved, though in accordance with the fashion among scholars of his age it was changed into the Latin and Greek equivalents. He studied at Deventer, where he displayed remarkable talents as a student of languages and literature. Later he entered a monastery near Delft and remained there as monk for six years. In 1492 he went to Paris to study six years, perfecting himself in theology and the humane sciences. He supported himself

largely by giving private lectures. Soon after he went to England and became a student of Greek at Oxford under Finacre and Metcolet. Later he returned to Paris, enriched his knowledge by traveling in Germany and Italy, and became the teacher of Alexander Stuart, son of James IV of Scotland, and with him visited numerous cities, but settled at Basel in 1514. In 1516 he published the first edition of the New Testament in Greek, this probably being his greatest work.

Erasmus took a middle ground on the issues of the Reformation, spending many of his later days in disputation with friends and foes, being unable to satisfy either party. The discussion with Luther on free will is among the most important, though there are many others from which he secured fame and consideration quite as lasting as were accorded to the more prominent men of letters. Many of the monarchs of Europe and others of influence and wealth sent him letters and presents as marks of friendship, and his correspondents included the most eminent men of learning. Among his writings are "Adagia," a collection of proverbs from the Greek and Latin, "The Christian Soldier's Dagger," "The Praise of Folly," a satire on kings and monks, and "Colloquia."

Erastus (*ê-rās'tūs*), THOMAS, physician and theologian, born in the canton of Aargau, Switzerland, Sept. 7, 1524; died Dec. 31, 1583. His real name was Thomas Lieber; he translated it into the Greek according to the fashion of his time. He graduated at the Univ. of Basel, traveled extensively, and later attained a doctor's degree at the Univ. of Bologna. His writings and lectures are numerous, and he exercised a marked influence upon medical theories and ecclesiastical and secular thought. He agreed with Zwingli on the doctrine of the Lord's Supper and insisted that the church cannot rightly excommunicate its members. Among his books are "On the Understanding of the Words of Christ" and "The Nullity of Church Censures."

Erb's Palsy (*êrbz pôl'zî*). See *Paralysis*.

Erckmann-Chatrian (*êrk'mân-shû-trê-ân'*), a compound name of two French-Alsatian writers of fiction. They formed a literary partnership in 1848, and together produced notable literary works. The partnership ceased in 1889, owing to differences over the division of the profits, though afterward the former friendship was re-established. Emile Erckmann was born May 20, 1822, in Alsace, and died Mar. 14, 1899. Alexandre Chatrian was born in Lorraine, Dec. 2, 1826; died in Paris Sept. 4, 1890. Both were educated in colleges of recognized standing, showed early aptitude for literary polish. Their first collaborative work (1848) was a drama entitled "Alsace in 1814." The entire productions of the two writers include many volumes, and cover all manner of interesting topics, especially romances.

Erebus (*êr'ê-būs*), in mythology, the son of Chaos and Night. He was changed into a river as a punishment for assisting the Titans. The term Erebus was frequently applied to a portion of the pagan inferno, a dark and gloomy space beneath the earth, through which the souls of the just passed on their way to enjoy the eternal and delightful life of Elysium (*q.v.*).

Erebus and Terror (*êr'ê-būs ānd tēr'êr*), the

names of two volcanoes in the Antarctic region, located in the northern part of South Victoria Land. They were discovered by Sir James C. Ross in 1841 and were so named from the two vessels used in the expedition. Mt. Erebus is 12,370 ft. high and is situated 30 m. E. of Mt. Terror, which has an elevation of 10,900 ft.

Erechtheum (*êr-êe-thē'um*), the name of a sacred edifice on the Acropolis, in ancient Athens. It was so named from Erechtheus, a fabulous hero of Greece, and it is thought to have contained the shrine of that hero and of Athene. The original building was burned by the Persians, but a new temple was built on the same site in 393 B.C. in the Ionic order. It had three porticos and contained the sacred olive tree of Athene and a salt spring said to have been made by the trident of Poseidon. The ruins of this building, located north of the Parthenon, contain the Porch of Caryatides, in which six female figures somewhat larger than life support the entablature.

Erfurt (*êr'fōort*), a city of Germany, in the Prussian province of Saxony, 145 m. S.W. of Berlin. It is connected by numerous railroad lines with important cities of Germany. The cathedral, one of the finest Gothic structures in the country, has a famous bell, the Maria Gloriosa, which weighs 13 tons. The Univ. of Erfurt was founded in 1378, but was suppressed in 1816. The monastery, which was the residence of Luther from 1501 to 1508, is now called Martinstift (Martin's establishment) and has been converted into an orphanage. The surrounding country is agricultural. The city produces woolen, cotton, silk, and linen goods, machinery, tobacco, leather, chemicals, and scientific instruments. The city was founded in the early part of the 5th century, when it was called Erpesford from its founder, Erpes. In the Middle Ages it grew rapidly, became strongly fortified, and until 1873 was counted a fortress of second rank. Owing to its convenient location, it has been a point of contention by foreign invaders. It was the seat of the celebrated Congress of Erfurt in 1808, which was attended by the Emperor of Russia, Napoleon, and various German monarchs. It became a part of Prussia in 1814. Following World War II it came under Soviet occupation. Population, *ca.* 135,000.

Erg (*êrg*), the unit of work or energy in the metric system. It is the work done by a force of one dyne (*q.v.*) through a distance of one centimeter in the direction of the force. The unit is extremely small, since it would require more than 12,000 ergs work to lift the five-cent coin one inch. A larger unit of work, the joule, is equal to 10,000,000 ergs.

Ergosterol (*êr-gōs'tēr-ôl*). Waxlike bodies, found in vegetable and animal fats, which do not form soaps with alkalis (*i.e.*, are non-saponifiable), are called *sterols*. Ergosterol is that sterol,

originally isolated from ergot, and now obtained from yeast, which when activated with ultraviolet light yields vitamin D. It has strong antirachitic properties (prevents rickets in bone development), and is known commercially as *viosterol*, *calciferol*, etc.

Ergot (*är'göt*), a fungus disease that attacks rye, barley, some kinds of wheat, and other grasses. The first sign of the disease is a sticky fluid on the developing heads of grain. Then black, horny bodies, called sclerotia, appear on the heads, replacing seeds; the adjacent seeds do not develop. The sclerotia are elongated and resemble a rooster's spur (Old French: *argot*), whence the origin of the name. The disease is fatal to the plants attacked. If diseased grain is eaten in large quantities it can cause death, both to men and animals. On the Western plains ergot appears largely in wild rye, often causing much damage to herds of domestic animals. A drug extracted from the sclerotia has the property of causing contraction of the uterus and so is used to check bleeding after childbirth.

Eric (*ēr'ik*), the name of several Swedish and Danish kings who ruled at different times between 1154 and 1568. The name is the Scandinavian form of Henry and was applied to several monarchs who ruled Sweden and Denmark separately, though some governed the whole of Scandinavia after the Union of Kalmar (1397).

Ericaceae (*ēr-ī-kā'sē-ē*) or HEATHS, small shrubs, often evergreen, widely distributed and covering large areas in northern and western Europe. Included in this family are the arbutus, azalea, rhododendron, huckleberry, and blueberry. About 1,500 species are known, many of which are cultivated.

Ericsson (*ēr'ik-s'n*), JOHN, Swedish-American engineer, born in Langbanshyttan, Sweden, July

31, 1803; died in New York, N.Y., May 8, 1889. He became an engineer cadet at the age of 12 and was promoted to captain in the Swedish army in 1827. Subsequently (in partnership with John Braithwaite), he constructed a locomotive engine, which he entered in a competition in England in 1829. Soon after, he produced in rapid succession an instrument for sea sounding, a hydrostatic weighing machine, and a tubular steam boiler. He patented in 1836 the screw propeller, which came into use the following year. Three years later he emigrated to the U.S. Several of his instruments, including a sea lead, a pyrometer, and an alarm barometer, were exhibited at London in 1851.

The U.S. government employed Ericsson in 1861 to construct several ironclad vessels (*q.v.*). Under this contract he completed (Jan. 30, 1862) the *Monitor*, which succeeded in combating the Confederate ironclad ram *Virginia* (also known as the *Merrimac*). The invention marked the beginning of a new era in naval warfare. In 1881 Ericsson built a torpedo-launching vessel called the *Destroyer*. Among his later scientific inventions is an instrument for computing the intensity of solar radiation and influences affecting the earth's rotation. In accordance with his own wishes, his remains were taken to Sweden and buried at his birthplace. They were transported to Stockholm with honors in the U.S. ship *Baltimore*. See *Merrimac*; *Monitor*; *Warship*.

Eric the Red (*ēr'ik THĕ rĕd*), 10th-century Norwegian navigator and explorer. Supposed to have killed a man in Norway, he fled to Iceland, where he committed another murder. To escape punishment, he sailed westward in 982 and discovered Greenland. After returning to Iceland in 985, he organized an expedition and with 14 vessels reached the coast of Greenland, where he settled. His son, Leif Ericsson (*q.v.*), reached North America about 1000. See also *Vinland*.

Erie (*ēr'ri*), a city and port of entry in northwestern Pennsylvania, seat of Erie County, midway between Cleveland and Buffalo.

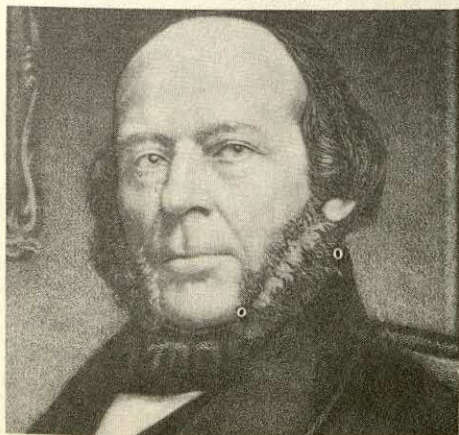
The city is a St. Lawrence Seaway port on the shore of Lake Erie and is served by four rail lines, the New York Central, Pennsylvania, Bessemer and Lake Erie (freight) R.R.'s and the Nickel Plate Road. Port Erie Airport is located 7 m. w. of the city's center.

Erie Harbor is one of the finest ports on the Great Lakes. It is Pennsylvania's only Lake harbor, and formed by Presque Isle, a peninsula which arches out from the land to make a natural breakwater six miles long. The harbor has been deepened to permit vessels plying the St. Lawrence Seaway to use its facilities.

Manufacturing in Erie is highly diversified, and includes paper, plastic and rubber products, metals, furniture, fixtures, and fabricated metals.

JOHN ERICSSON

Courtesy Brown Bros., N. Y.



Printing and publishing are important industries.

Erie dominates a standard metropolitan statistical area (812 sq. m., pop., 1960, 250,682) which covers all of Erie County. In 1958 the area had a value added by manufacture of \$308,019,000. The city's value added was \$159,876,000.

Mercyhurst, Gannon, and Villa Maria colleges are located in Erie. Notable religious structures in the city include the Cathedral of St. Paul (Protestant Episcopal) and St. Peter's Cathedral (Roman Catholic). There is a state park on the Presque Isle peninsula, and memorials to Com. Oliver H. Perry and Gen. Anthony Wayne (qq.v.) are maintained. Erie occupies the site of Presque Isle, a fort built in 1753 by the French, who abandoned it in 1759. The English held the fort, 1760-63. In the War of 1812, the city was the headquarters of Com. Perry (see *Erie, Battle of Lake*). Laid out in 1795, Erie was first incorporated in 1805 and chartered as a city in 1851. Population, 1930, 115,967; in 1960, 138,440.

Erie, BATTLE OF LAKE, a naval engagement of the War of 1812, fought near the island of Put-in-Bay, in the western part of Lake Erie, on Sept. 10, 1813. The American fleet under Com. Perry consisted of nine small vessels, which had been built hastily at Presque Isle, and the British fleet under Com. Barclay had six vessels. Com. Perry used the *Lawrence* as his flagship, on which the British concentrated their fire and so disabled it that he

was compelled to shift his flag to the *Niagara*. The fighting became general and the British were compelled to strike their colors. Perry reported the victory to the government officials in these words: "We have met the enemy, and they are ours—two ships, two brigs, one schooner, and one sloop." As a result of the battle the Americans secured control of the Great Lakes and Northwest Territory.

Erie Canal, a part of the New York State Barge Canal, the largest canal of the U.S., extending from Buffalo to Albany, N.Y., a distance of 363 m. The canal was first suggested by Gouverneur Morris, who headed a commission of inquiry in 1810, and a law authorizing its construction was enacted in 1817. The first canal boat, the *Seneca Chief*, left Buffalo on Oct. 26, 1825, with Gov. De Witt Clinton of New York as a passenger. The canal revolutionized trade with the Great Lakes and the interior because railroads were as yet unknown. It shortened travel time between Buffalo and New York City from 20 days to less than ten and reduced freight costs per ton from \$100 to \$10; between Buffalo and Albany, freight charges per ton dropped from ca. \$90 to \$3.

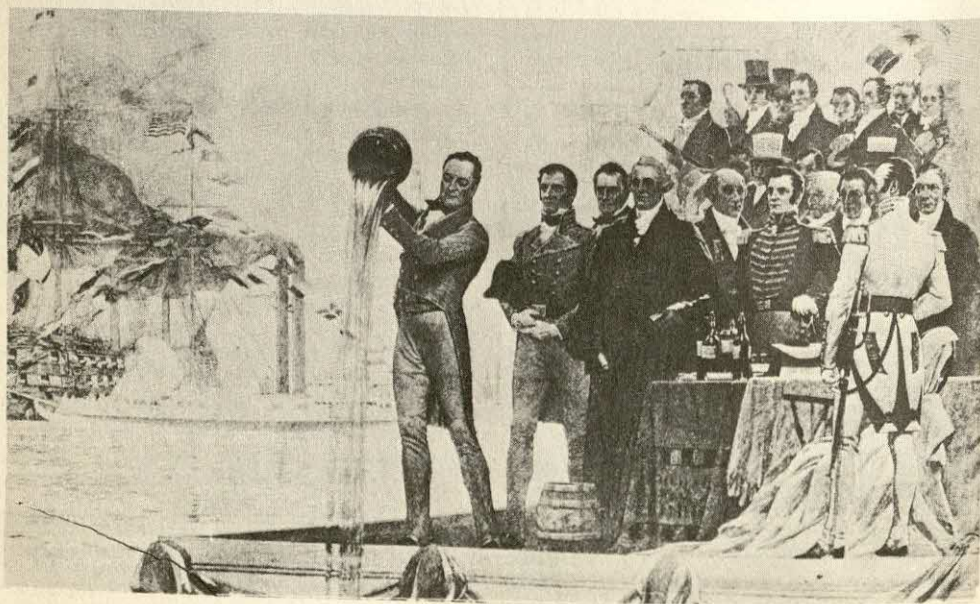
The canal, as originally constructed, was 40 ft. wide and 4 ft. deep and cost more than \$7,000,000. It was enlarged several times thereafter. The expansion of the canal to form a

OPENING OF THE ERIE CANAL

From a painting by Charles Y. Turner (1850-1919)

Gov. Clinton, at Sandy Hook, pours water from Lake Erie into the ocean, symbolizing the joining of the Atlantic Ocean and the Great Lakes by the Erie Canal

Official Netherlands Photo



340-m. part of the New York State Barge Canal (*q.v.*) was implemented in 1903, when a bond issue for \$101,000,000 was authorized by popular vote. The sum also provided for the improvement of the Oswego and Champlain Canals, and additional appropriations were later made for the Seneca and Cayuga Canal.

Erie, FORT, a town in Welland County, Ontario Province, Canada. See *Fort Erie*.

Erie, LAKE, one of the five Great Lakes of North America, between Lakes Huron and Ontario. It washes part of the northern boundary of New York, Ohio, and Pennsylvania, the eastern shore of Michigan, and the southern shore of the province of Ontario. The discharges of Lakes Superior, Michigan, and Huron flow into it through the Detroit River, while the outflow is into Lake Ontario by the Niagara River. Its elevation is about 572 ft.; length, 240 m.; and area, 9,940 sq. m. The Sandusky, Maumee, Detroit, and Grand (in Canada) are the principal rivers flowing into it. Canal connections are maintained with the Hudson River by the Erie Canal, with the Ohio by the Ohio and Miami, and with Lake Ontario by the Welland. It has excellent fisheries and a large commerce. The naval victory gained by Com. Perry over the British in the western part of the lake is commemorated by a monument at Cleveland and by a stone on the island of Gibraltar, near which the battle was fought. Among the chief harbors in the U.S. are those of Erie, Buffalo, Sandusky, Cleveland, Toledo, and Dunkirk. Those of Canada include Point Dover, Kingsville, Port Colborne, and Welland.

Erigena (*ĕ-rĭj'ĕ-nā*), JOHANNES SCOTUS, also known as JOHN THE SCOT, philosopher and scholar, born in Ireland of Scottish parents *ca.* 815; died in England (?), *ca.* 877. Little is known about his early life. Upon the invitation of Emperor Charles II (the Bald), he became head of the Palatine Acad. in the French court and in this position greatly furthered his reputation as a brilliant scholar. About 845 he translated the works of Pseudo-Dionysius, a Father of the Church, into Latin; for doing this he fell into disfavor with the Church for not having submitted the work to the Pope for his approval before its release. Erigena is remembered as one of the few bold speculative thinkers of his time who investigated philosophical problems outside the contemporary orthodox theology. "On the Division of Nature," his most famous work, later condemned as "heretical perversity," attempted to reconcile the two branches of philosophical thinking—reason and authority—by suggesting that the world and God were merged in an ultimately higher unity of nature.

Eritrea (*ā-rĕ-trā'ā*), or ERYTHREA, an autonomous unit federated with Ethiopia under the sovereignty of the Ethiopian crown, located in

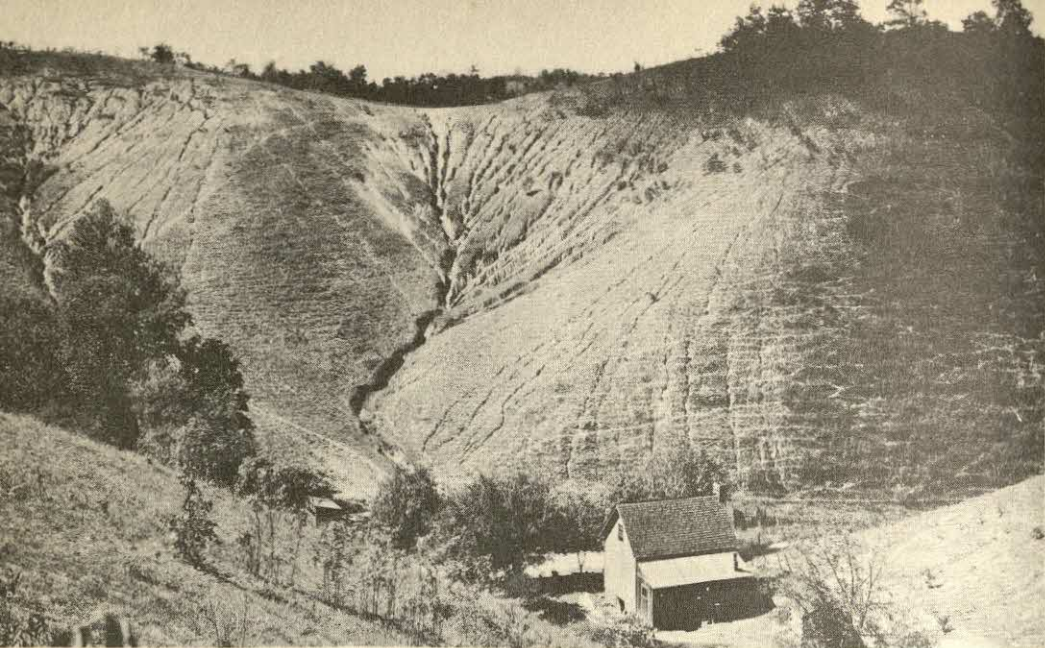
northeastern Africa, on the west coast of the Red Sea. The area is about 50,000 sq. m. It is inhabited chiefly by nomadic tribes of Arabs, but there are a number of small towns, including Asmara, the capital and seat of local government. Stock raising is the main industry with products of butter, meat, and hides, supplied by cattle, sheep, and goats. There are pearl fisheries of considerable importance along the coast, and the import and export trade is quite large. Eritrea became an Italian colony in 1882 and remained under Italian control until 1940 when it was occupied by the British during World War II. After the war the future status of Eritrea was referred to the U.N. which in 1950 voted to make the country an autonomous unit federated with Ethiopia (*q.v.*). Population, 1947 (est.), 1,000,000.

Erivan (*ĕ-rĭ-vān'*), or YEREVAN, capital of the Soviet Socialist Republic of Armenia since 1921; located on the Zanga River. Founded about 661 A.D., the city was once of great strategic importance and belonged at various times to the Turks, Persians, and Russians. It is outstanding for its vineyards and orchards as well as for manufactures of cotton goods, silk, bricks, and leather products. Population, *ca.* 200,000.

Erlanger (*ĕ-rĭ-lān-gĕr*), JOSEPH, physiologist, born in San Francisco, Calif., Jan. 5, 1874. He studied medicine at Johns Hopkins Univ., obtaining his degree in 1899, and remained there as a professor of physiology until 1906. From 1906 to 1910 he taught at the Univ. of Wisconsin, and from 1910 until his retirement in 1946 he was head of the department of physiology at Washington Univ. in St. Louis. His work was centered primarily on blood pressure, the heart, and the nervous system, and he prepared numerous articles on his research. In 1944 he shared the Nobel Prize in physiology and medicine with Herbert S. Gasser (*q.v.*) for their research into the different functions of the individual nerve threads.

Ermine (*ĕ-r'mĭn*), or STOAT, a small mammal allied to the weasel family, found in the northern portion of Europe, Asia, and America. The body in summer is reddish-brown above and white beneath, and in winter it is wholly white, except the tip of the tail. The body is about 10 in. long, without the tail, which is about 5 in. The fur is soft and silky and considered very valuable. It is used in making official robes and expensive wraps. The ermine lives in holes in the ground and under rocks, and feeds on mice, rats, birds, chickens, and other small animals, sucking the blood.

Erne (*ĕrn*), a river and lake of Ireland, in Ulster County. The river rises in Lake Gowna and flows into Donegal Bay, passing through Lough Erne in Fermanagh County. It is 60 m. long and is navigable from Ballyshannon to the outlet. Lough Erne consists of two lakes, the upper and the lower, and is usually known as Lake Erne.



Courtesy Tennessee Valley Authority

EROSION

An example of how heavy rains wash away the soil on unprotected land. Phosphates, terracing of slopes, and reforestation help to reclaim such areas

It is rich in fish and eels, and the scenery is interesting and attractive.

Ernst (*ěrnst*), MAX, painter, a founder of the surrealist movement, born in Cologne, Germany, April 2, 1891. He studied philosophy at the Univ. of Bonn, and in World War I served in the German artillery. Invalided home in 1917, Ernst, who had no formal art training, set himself up as a painter. Without much of a following in Germany, Ernst moved to Paris in 1928, where, together with another German-born artist, Hans Arp, he aided in launching the surrealist movement. Surrealism (*q.v.*) represented a turn to the world of phantasy, away from the intellectuality of abstract art. While the cubists were not interested in literary subject matter, the surrealists stressed it again, presenting spontaneous reactions to the subconscious and the dream world. Ernst was known in Paris almost as much for his eccentric mannerisms as he was for his art. In 1941, after some months in a German concentration camp, he emigrated to the U.S. Some of his paintings are on exhibition in the gallery Art of Tomorrow in New York City, as well as in the Museum of Modern Art.

Eroica (*ě-r-ō'ī-kā*), title of the Third Symphony by Ludwig van Beethoven (*q.v.*), first performed publicly in Vienna, Austria, under the composer's leadership, 1805. Beethoven first dedicated the work to Napoleon Bonaparte, but when he learned that Napoleon had crowned himself emperor (1804), he tore the front page from the music.

Erosion (*ě-r-ō'zhūn*), in geology, the influence of running water, waves, and wind in wearing

away rocks and other substances. Immense quantities of silt are deposited at the mouths of rivers as deltas, which show that the geological structure of the earth's crust is being changed by this agency. The erosion theory attributes the excavation of valleys and other depressions chiefly to the erosive power of water in the form of glaciers, instead of regarding them as due to depressions, cracks, or fissures in the strata produced by strains during upheavals through volcanic action. See also *Agriculture; Conservation; Soil; Soil Conservation*.

Erratic Blocks (*ě-rāt'ik blōks*), or ERRATICS, in geology, the boulders on the surface of the ground which have been transported from their original location by the action of glaciers and icebergs. They consist largely of granite, and in some cases were transported great distances from their original location. Many rocks of this class are found in the south central part of Canada and the north central part of the U.S., extending from Saskatchewan through North and South Dakota and southward into Iowa.

Erse (*ěrs*), a Scotch term meaning "Irish," especially designating the Gaelic language spoken in Scotland. The term is sometimes wrongly used in designating the Gaelic spoken in Ireland.

Ersine (*ě-r'skīn*), JOHN, author, born in New York, N.Y., Oct. 5, 1879; died there June 2, 1951. He took his Ph.D. at Columbia Univ. (1900), was associate professor of English at Amherst Coll. (1906-09), professor of English at Columbia (1916-37), and professor emeritus (1937-51).

Co-editor of the "Cambridge History of Eng-

lish Literature" (3 vols., 1917-19) and "Outline of Literature" (1923), he also published many books on English history, contemporary writing, and poetry.



Courtesy Alkahest Celebrity Bureau

JOHN ERSKINE

In most of his novels, Erskine employed the same successful formula, that of retelling a well-known classical story in modernized, "streamlined" form. Among his numerous books of this type were "The Private Life of Helen of Troy" (1925), his first and most popular novel, and "Galahad" (1926), "Penelope's Man" (1928), "Tristan and Isolde" (1932), "The Brief Hour of François Villon" (1937), and "Venus the Lovely Goddess" (1949). His other, more serious works included "Democracy and Ideals" (1920), "Prohibition and Christianity" (1927), "Give Me Liberty" (1940), "The Complete Life" (1941), and "The Human Life of Jesus" (1945). He also wrote "My Life in Music" (1950).

Erskine, LORD THOMAS, Scottish orator and lawyer, born in Edinburgh, Scotland, Jan. 21, 1750; died Nov. 17, 1823. The youngest son of the Earl of Buchan, he was educated partly at Edinburgh and partly at the Univ. of St. Andrews, and entered the navy in 1764. After serving in the navy four years and in the army seven, he entered upon the study of law at Cambridge, where he took a degree in 1778, and was called to the bar on July 3 of that year. His eminent success caused him to be elected to Parliament in 1783 for Portsmouth, which seat he held until he was raised to the peerage in 1806. He defended Stockdale, a bookseller, in 1789 on charges of libel brought for publishing a pamphlet in favor of Warren Hastings.

Erskine lost the office of attorney general to the Prince of Wales in 1792, because of his de-

fense of Thomas Paine who was being prosecuted for publishing the second part of his "Rights of Man." Erskine maintained that it was right to defend a case even if he was not in full sympathy with the convictions and views of his client. The Prince of Wales, afterward George IV, made him keeper of his seals for the duchy of Cornwall in 1802, and in 1806 he was made peer and elevated to the office of lord chancellor. His publications included "View of the Causes and Consequences of the War With France."

Eruption (*ê-rûp'shôn*), in geology, the violent ejection of gases, steam, and fragmentary matter accompanied by a flow of molten lava, such as occurs in volcanoes, or by a flow of hot water such as occurs in geysers.

Ervine (*êr'vîn*), ST. JOHN GREER, playwright, novelist, born in Belfast, Ireland, Dec. 28, 1883. His first play, "The Magnanimous Lover," was produced in 1907 at the Abbey Theater, Dublin, of which he became manager in 1915. He was professor of drama at the Royal Society of Literature (1933-36).

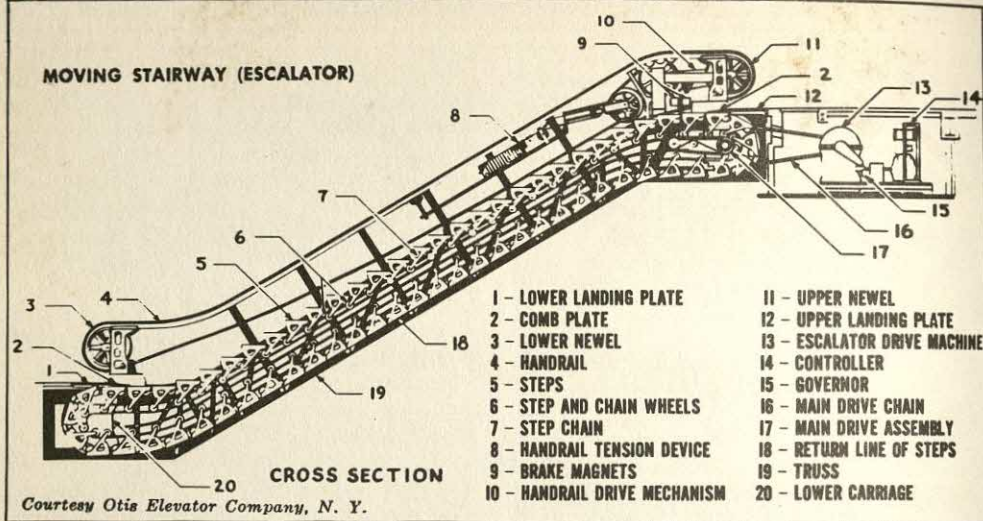
The best-known dramas by Ervine include "Mixed Marriage" (1910), "Jane Clegg" (1911), "John Ferguson" (1914), "The First Mrs. Fraser" (1928), "People of Our Class" (1934), and "Robert's Wife" (1937). Among his novels are: "Mrs. Martin's Man" (1915), "Alice and a Family" (1915), "Changing Winds" (1918), and "The Wayward Man" (1928).

Erysipelas (*êr-i-sîp'ê-las*), an inflammatory disease of the skin. It is attended by fever and diffused redness and swelling of the parts affected, and later by peeling off of the scarf-skin in the milder forms, or by suppuration of the deeper parts in severer cases. There is usually considerable pain, with heat and tingling in the affected parts. The treatment consists for the most part in watching closely the progress of the case and obviating special dangers as they may occur. Iron is sometimes used as a specific remedy. The disease is contagious.

Erythema (*êr-y-thê'ma*), in medicine, a superficial reddening of patches of the skin, sometimes accompanied by a feeling of heat. It is not a disease in itself but rather a symptom of various disorders such as sunburn, rheumatism, and indigestion. It may also result from the use of certain drugs.

Erzerum (*êr-zê-rôom'*), or ERZURUM, a Turkish vilayet in the northeastern part of Turkey-in-Asia, having an area of 11,182 sq. m. and a population of ca. 325,000. The capital city, also named Erzerum, is situated on the Turkish-Russian railroad in the mountains of Turkish Armenia, and has been an important military station and trading center since the early history of Arabia. Religious pilgrims often stop at the city on

MOVING STAIRWAY (ESCALATOR)



their way to worship at Mecca. In A.D. 700 it fell into the hands of the Byzantines, and was later successively conquered by the Arabs, Mongols, and Turks. The Russians took possession of it in 1829 and again in 1878, although later they restored it to the Turks. In 1916 the Russians, under Grand Duke Nicholas, after assaults lasting five days, captured it from the Turks. Population, 1930, 80,106; in 1941, 36,414.

Erz Gebirge (*ěrtś' ge-bě'r' ġe*), a mountain range in Europe, extending a distance of 185 m. and forming a natural boundary between Czechoslovakia, and Saxony, Germany. The name means Ore Mts. in German and originated from the wealth of iron, copper, cobalt, lead, silver, coal, and arsenic found in the region. The highest peak is the Keilberg (4,080 ft.).

Esarhaddon (*ě-sār-hād'dōn*), a celebrated king of Assyria, son and successor of Sennacherib. He reigned from 682 to 668 B.C., during which time he distinguished himself as a general and an organizer. He rebuilt Babylon (which had been destroyed by his father), made it his southern capital, and greatly extended his dominion. He invaded and conquered large parts of Media, and made himself King of Egypt and Ethiopia. Later he conquered Manasseh, King of Judah, and carried him captive to Babylon.

Esau (*ě'sā*), in the Old Testament, the eldest son of Isaac and Rebekah, and twin brother of Jacob; founder of the Edomites. The favorite of Isaac, he was a rough, cunning hunter, but carefree. It is recounted that he allowed Jacob to defraud him of his birthright for a dish of pottage, Jacob having been assisted by Rebekah in cheating Esau out of the paternal blessing intended for him by Isaac. When Esau learned that Jacob had deceived him, he vowed Jacob's destruction, and Jacob was sent to live with his uncle Laban, in Padanaram, for safety. Esau married two Canaanitish women and later married

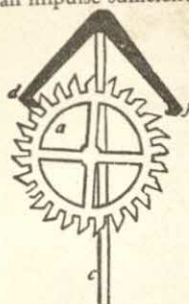
his cousin, the daughter of Ishmael. He afterward became reconciled to Jacob, who returned home for the burial of his father (Genesis 25-36).

Escalator (*ě's-ě-lā-těr*), or ELECTRIC STAIRWAY or MOVING STAIRWAY, a moving stairway transporting persons from one floor to another in a structure. The first flat-step type of escalator was invented by Charles D. Seeberger, and was installed by the Otis Elevator Co. at the Paris Exposition in 1900, under the copyrighted name "Escalator." Operated by endless chains from a motor-driven, worm-gear reducing machine and an electric controller, the escalator appears to the observer as a series of moving steps with a stationary balustrade and a moving rubber handrail. The steps travel on tracks, turn over at the limits of travel, and then return to the other end of the flight underneath the steps in use. The newer escalators are reversible; i.e., an elevator can be adjusted so that it can be operated either up or down. See illustration.

Escanaba (*ěs-kā-nā'bā*), a city, the county seat of Delta County, Mich., in the central part of the northern peninsula of the state. It is on the Chicago & North Western and the Escanaba and Lake Superior R.R.'s, has a natural deep-water harbor tributary to Green Bay and Lake Michigan, and is an important shipping point. The chief buildings include the county courthouse and the public library. Among the manufactures are lumber, veneers, paper, furniture, gloves, and welding equipment. The city was settled in 1863 and incorporated as a city in 1883. Population, 1904, 11,098; in 1930, 14,524; in 1940, 14,830; in 1950, 15,170.

Escapement (*ěs-kāp'měnt*), a mechanical device intervening between the power and the time measurer of a clock or watch, to secure uniformity in the rate of movement. It consists of two principal parts, the escapement wheel *a* and the lock *d j*; through these the power imparts to the

pendulum *c*, or balance wheel (time measurer), an impulse sufficient to overcome the friction and



ESCAPEMENT

resistance of the atmosphere, and thus keeps up the vibration. These alternate motions of the lock serve to arrest and release the escape wheel at uniform intervals, thus governing the movement of the timepiece. The principle is the same whether the moving power consists of springs or weights. Among the different escapements in use

are the chronometer, anchor, lever, cylinder, duplex, and horizontal.

Escape Velocity (*ēs-kāp' vē-lō's'i-tī*), the minimum velocity needed by a projectile to leave the gravitational field of a celestial body permanently. The escape velocity is equal to the speed with which an object would strike the surface of the body if dropped from an infinite height above it and depends only upon the mass and radius of the body and not on the mass of the projectile. The escape velocity for the earth is 25,000 m.p.h., for Jupiter 136,000 m.p.h., for the sun 1.38 billion m.p.h., and for the moon 5,300 m.p.h. It is believed that the moon has no atmosphere because gas molecules on its surface would have velocities exceeding the escape velocity, owing to their kinetic energy of motion. A prerequisite for space travel (see *Astronautics*) is a rocket (*q.v.*) that can propel a space ship at least 25,000 m.p.h., in order for it to be free of the gravitational pull of the earth.

Eschatology (*ēs-ēā-tōl'ō-gy*), a theological term, derived from two Greek roots, *eschaton* and *logos*, and meaning the study of the last things. It has a definite connotation in Roman Catholic theology, signifying the study of the doctrines of the Church on heaven, hell, purgatory, and the Last Judgment. For the past 150 years, however, the word has been used in other circles to embrace a comparative study of popular beliefs on death and the afterlife with the purpose of throwing further light on references to the last end of man and mankind in the New Testament.

As in fundamentalist denominations of modern times, so from the earliest days of the Church there has existed a belief in the coming of Christ at the end of the world. This belief holds that he will then judge all mankind and eternally determine individual rewards or punishments. The early Christians most certainly had a popular hope that Christ would come soon, but it would be untrue to say that this belief is clearly echoed in the Gospels or the Epistles. Out of the popular expectation arose various popular notions about

the time and the manner of Christ's coming. The most famous expression of this hope is to be found among the believers in Chiliasm (*q.v.*).

When, however, the Christians came up out of the catacombs after the Edict of Constantine, their preoccupation with establishing a Christian society on this earth gradually overshadowed their desire to see the triumphal coming of Christ, who would reward them for their faith during persecution. Moreover, the apocalyptic form of literature seems to have lost its appeal even before this, and with it also went the popular interest in the subject.

Eschatology will always attract some scholars who wish to trace the origins of Christian beliefs in the Jewish religion and the mystery cults of the Near East. There is no doubt that the Christian belief is rooted in Judaism, but it remains to be proved that the popular apocalyptic Jewish writings formed the basis of the Christian teaching.

Protestantism, as such, did not attach great importance to eschatology. Only members of mystical Protestant sects, such as Pietism (*q.v.*) and its derivatives, became interested in eschatology. See also *Last Judgment*; *Millennium*.

Escorial (*ēs-kōr'i-ql*), or ESCURIAL, an ensemble of buildings about 30 m. n.w. of Madrid, Spain, comprising a palace, church, monastery, museum, library, and burial place. It is located on a slope of the Sierra de Guadarrama, about 3,700 ft. above sea level. It was built by the architects Bautista de Toledo and Juan de Herrera for Philip II (*q.v.*), and was dedicated to St. Lawrence in commemoration of the victory of St. Quentin over the French on St. Lawrence's Day, Aug. 10, 1557. The main building was begun in 1563 and completed after 21 years. The whole complex, with a length of 740 ft. and a width of 580 ft., comprises two large courtyards and two smaller ones. In the center of the structure stands the church, which, with its central dome, clearly reflects an Italian influence. Marble tombs in the church contain the remains of all the kings of Spain from Charles V to Alfonso XII, except Philip V and Ferdinand II, the tombs being in tiers, in niches constructed in the walls. The art collection of the Escorial contains some of the world's greatest paintings, among them works of Titian, Velasquez, El Greco, and Rogier van der Weyden (*qq.v.*).

Escudo (*ēs-kōō'dō*). See *Coins*.

Esdraelon (*ēs-drā-ē'lōn*) or PLAIN OF JEZREEL, a fertile valley of Israel, extending from the Mediterranean toward the Jordan, along the eastern side of the Carmel Range. It is drained by the Kishon River and noted for its present high state of cultivation, although before 1869 it was laid waste periodically by the Arabs. This valley was the scene of many historical events, from Biblical



ESCORIAL

Courtesy Brown Bros., N. Y.

times to the present (e.g., Gideon's victory over the Midianites; Napoleon's victory over the Turks, 1799; Allenby's offensive against the Turkish army in World War I). With the advent of Zionism (q.v.), the "Emek" (Hebrew, meaning plain or valley), or the Plain of Jezreel, became the home of many Jewish colonies, and the area was thus developed economically.

Esdras (ēz'drās), BOOKS OF, the name of two books of the Old Testament. They are usually given as the *First Book of Esdras* and the *Second Book of Esdras*, and generally appear as the first two books of the Apocrypha. The former contains a portion of Nehemiah, the Book of Ezra, and two chapters of II Chronicles, and was translated from the Hebrew. The latter, according to recent critics, was composed about A.D. 90, and was written in Hebrew or Greek. See *Bible*.

Esker (ēs'kēr), also known by the term *os*, which is used mainly by Swedish geologists, an extremely long and winding ridge of thoroughly mixed ("poorly sorted," in more technical language) sands, silts, gravels and boulders. Quite generally speaking, they are found to be 150 m. long, at the most; the majority of eskers are shorter. Their height may reach 40 ft. (Penobscot Bay, Me.) or more.

The esker is made of materials that were carried by the streams of water which flowed through tunnels at the bottom of the vast ice sheets covering various parts of the world during glacial times. The physical laws that govern the movement of materials by water teach that the water in these tunnels must have been at rather high pressure; otherwise the materials would not be so thoroughly mixed.

Eskers frequently end in deltas. They are also frequently buried under great sheets of soil and loose rock that were left after the local sector of

ice sheet had melted and run off as water. Finally, eskers often run across swamps (undrained sectors of melted ice sheet); here engineers use them for roadbeds.

In the U.S., eskers are found in Illinois, Maine, Michigan, Minnesota, the Mississippi valley, central New York, and Wisconsin. They are also known throughout the Baltic-Fennoscandian area, where they were first studied.

Eskimos (ēs'kī-mōz) or ESQUIMAUX, a Mongoloid people found native in northern North America, Greenland, and the northeastern tip of Asia. The name Eskimo is believed to be of Indian origin and to mean "eaters of raw meat." The Eskimo's diet is about 95 per cent meat and fish, largely raw. Their own name for themselves is *Inuit*, meaning "men" or "people."

Most Eskimos are short, and their weather-tanned faces disguise the fact that their skin is not much darker than that of many Europeans. Their cheek bones are prominent, and their eyes oblique, especially in childhood. The ever-ready Eskimo smile shows a characteristic straight line of worn-down teeth—a result of chewing hides for boot leather, harpoon lines, etc.

Most Eskimos live near the sea, and all Eskimos speak dialects of the same language. However, a few groups in Alaska and northwest of Hudson Bay live inland and are more like the Indians than the other Eskimos.

The snow house is important to only about one-fourth of the Eskimos. Various other types of winter houses are built of stones and sod, half underground for warmth. Heat is provided by stone lamps burning animal fat. In summer, all Eskimos use tents.

The small one-man kayak, made of skin, is an ingenious and necessary boat among most Eskimos. In it the paddler wears a waterproof hooded

garment, which is tied around the hole in which he sits. The Eskimos hunt with great skill in this boat, and many can turn completely over in it and right themselves. They take risks in rough, icy water, however, and many drownings occur in some regions.

The Eskimos live in small settlements numbering from a few families to a few hundred individuals. They have no tribal chiefs. The people of one or a few villages will simply recognize the leadership of an able hunter or influential medicine man (*angakok*). In Alaska, where the Eskimos hunt whales in a large skin boat (*umiak*), the captain and owner is sometimes accorded the authority of a sort of chief.

The religion of the Eskimos is based on ceremonies to obtain the good will of deities controlling weather and game, and on magical rites for the curing of sickness, etc. Most Eskimos have now been influenced by Christian missionaries. Eskimos' skill with harpoon and arrow has dwindled with the introduction of firearms, which have considerably depleted their food supply. The Eskimo dog, which is indispensable in hunt-



Courtesy Amer. Mus. of Natural History, N. Y.
GREENLAND ESKIMO

ing and in sled travel, varies much in size and appearance but sometimes shows close relationship with the wolf.

Until the products of civilization were made available to the Eskimo, he lived much as man's ancestors must have in the Stone Age. Although severely limited in material possessions, the Eskimo has always won admiration for his cheerful spirit and ingenuity, and his innate intelligence is generally considered high. The total number of Eskimos is estimated at about 40,000.

Eskimo Dog. See *Eskimos*.

Esmarch (*ēs'märk*), JOHANNES FRIEDRICH AUGUST VON, surgeon, born at Tönning, Schleswig-Holstein, Jan. 29, 1823; died at Kiel, Feb. 23, 1908. Educated at Kiel and Göttingen, he served as physician general of the army in the Franco-Prussian War of 1870-71. He was considered the greatest authority on gunshot wounds up to his time, and was the inventor of ambulances and the bloodless method of performing operations on the limbs. He published a number of books on surgery and two famous works on first aid, for instance, "The Contest of Humanity Against the Woes of War."

Espalier (*ēs-pāl'yēr*), in horticulture, a trellis or railing on which shrubs, vines, and fruit trees are trained to grow in a flat position. The same word is used to describe this method of raising plants and trees and a tree or plant thus grown.

Esparto (*ēs-pär'tō*), a species of grass grown extensively in Spain and Northern Africa. It is especially valuable for its strong fiber, which is used in the manufacture of paper, mats, nets, and cordage. It has been acclimated in the U.S. and is grown to some extent as a commercial product.

Esperanto (*ēs-pē-rän'tō*), the international artificial language invented by L.L. Zamenhof, a scholar of Warsaw, Poland. He prepared (1887) an exhaustive Esperanto grammar, which has since been translated into about 40 of the leading languages. Esperanto societies are maintained in some of the leading cities of Europe and America. This language, in contrast to another "artificial" language, Volapük (*q.v.*), which Esperanto has completely displaced, uses word roots which are common to several European languages based largely on Latin. Since the spelling is entirely phonetic, students may learn to read and speak it with facility in a comparatively short time. The English sentence "The international language is comprehensible to the whole educated world" appears as follows in Esperanto: "La lingvo internacia estas komprenebla de la tuta edukita mondo."

Some one language has occupied a place of supremacy at all times. The Babylonian tongue was the language of diplomacy in the 2d millennium B.C. Alexander the Great made Greek the leading language, but it in turn, during the prosperity of Rome, gave way to Latin, which remained the language of scholars in Europe throughout the Middle Ages. French became the

language of diplomacy in the 18th century. English sprang into use as the language of commerce in the 19th century, while German came to be indispensable to the scholar.

In a perfect system of communication each idea has its own separate symbol, as we find in the mathematical formulas and the chemical signs, but the connotation in the natural languages is very imperfect. English is the most imperfect in respect to spelling. An artificial language is intended to correct these difficulties. In Esperanto these faults are reduced to a minimum. Each sound has but one symbol. Each word represents one idea. Those who have taken a leading part in the spread of the language maintain an organization known as the International Esperanto League, which holds annual Universal Congresses attended by approximately 40 nationalities.

Thousands of books have been published in Esperanto, many radio broadcasts are sent out in Europe and South America, and postage stamps with Esperanto text have been issued by Russia and Brazil. Esperanto is now the only living "interlanguage," and has spread to all civilized lands in both the Occident and Orient.

Those who advocate the use of Esperanto as an official international language hold that widespread use of a common language promotes understanding among all nations, thus furthering world peace.

Espionage (*ēs'pī-ō-nāg*), derived from the French noun *espionnage* or the verb *espier*, to spy, to spy. In general, espionage means just that, the practice of spying. In reference to countries the term implies the clandestine obtaining of information about another country usually detrimental to the latter country. Espionage was common in primitive tribes and ancient civilizations, as well as during the Middle Ages, but it was not organized as a definite system until the 18th century under Frederick the Great of Prussia. Elaborately developed, the system of international espionage figured largely in World War I; however, it was offset by a system of counter-espionage. In addition to general espionage, there are specific types of spying, such as military, industrial, and commercial espionage. In the hope of eliminating espionage and governments' need for espionage agents, bureaus, etc., the League of Nations set up a clearing house of military information. However, cases of espionage have continued, and increasingly efficient counter-espionage agencies have been established by all nations; e.g., the F.B.I., Federal Bureau of Investigation (*q.v.*), in the U.S.

Modern *Espionage Acts* of this country date from the act passed June 15, 1917. This act fixed a fine of \$10,000 and 20 years' imprisonment upon persons guilty of interference with the draft or of

disloyalty. The death penalty was to be inflicted in the case of communicating documentary information on national defense to a foreign government. The same act gave the President absolute control over all foreign and domestic vessels' movements within U.S. waters and over matters concerning exportations to foreign countries.

The *Sedition Act* of May 16, 1918, amended the Espionage Act by extending the penalty to persons obstructing the sale of U.S. bonds, discouraging recruiting, and uttering, writing, or



Courtesy Museum of Modern Art, N. Y.

ESPIONAGE POSTER BY HENRY KOERNER, 1942

publishing anything disloyal to the government. The act provided that any such printed material could be barred from the mails by the Postmaster General.

Enforced in peacetime as well as during war by the F.B.I., the above acts were expanded by a new law, Dec. 2, 1940, making sabotage a crime at all times, defining the offense to include overt acts against transportation, war production, utilities, arsenals, military posts, railroads, and water lines with a maximum fine of \$10,000 or 10 years' imprisonment for sabotage of defense activities during a national emergency.

Esquimalt (*ēs-kwī'mālt*), a seaport of Canada, in British Columbia. It is located on Vancouver Island, 3 m. s.w. of the city of Victoria, on the Strait of San Juan de Fuca. The harbor is landlocked and contains a navy yard and a dry dock. Esquimalt is the headquarters of the British Pacific squadron, is strongly fortified, and is connected by railway with the coal mines at Nanaimo. Population, *ca.* 1,200.

Essay (*ěs'sá*), a literary composition shorter and less formal than a treatise, and which embodies the opinion of the writer on some general subjects. The term is sometimes used interchangeably with the word *treatise*. The writing of essays as a separate form of literature began in the 16th century, although such ancient writers as Plutarch and Cicero are rightfully classed with the essayists. Montaigne, the eminent French writer, may be credited as the father of the essay. Voltaire, Lamartine and Rousseau are among the leading French essayists, and those of Germany include Lessing and Schlegel. The following list contains some of the leading essays of European and American literature:

Joseph Addison	 "The Spectator"
Matthew Arnold	 "Essays in Criticism"
Francis Bacon	 "Of Studies"
Max Beerbohm	 "More"
Thomas Carlyle	 "Sartor Resartus"
Gilbert K. Chesterton	 "A Short History of England"
John Dryden	 "Essay on Dramatic Poesy"
T. S. Eliot	 "Selected Essays"
Ralph W. Emerson	 "Conduct of Life"
Hermann Grimm	 "Fifteen Essays"
William Dean Howells	 "Literature and Life"
Oliver W. Holmes	 "Breakfast Table Series"
Thomas Huxley	 "Essays"
Washington Irving	 "Salmagundi Papers"
Henry James	 "Notes on Novelists"
Alphonse de Lamartine	 "Confidences"
Charles Lamb	 "Essays of Elia"
Gotthold E. Lessing	 "Der Laokoon"
John Locke	 "Essays on the Understanding"
James Russell Lowell	 "Among My Books"
Thomas B. Macaulay	 "Milton"
Michel de Montaigne	 "Essais"
Christopher Morley	 "John Mistletoe"
Walter Pater	 "Marius the Epicurean"
Agnes Repplier	 "Points of Friction"
Jean Jacques Rousseau	 "Confessions"
John Ruskin	 "Sesame and Lilies"
Friedrich von Schlegel	 "Philosophy of Life"
Sir Richard Steele	 "The Spectator"
Sir Leslie Stephen	 "Essays on Free Thinking and Plain Speaking"
William M. Thackeray	 "English Humourists"
Henry David Thoreau	 "Walden"
Miguel de Unamuno	 "Essays and Soliloquies"
Voltaire	 "Essays on the Nations"

Essen (*ěs'sen*), a city of Germany, in what was formerly the kingdom of Prussia, about 20 m. N.E. of Düsseldorf. The cathedral, founded in 873, contains many treasures of art. Among its industries is the Krupp steel and iron works. These were rated among the most extensive establishments in the world prior to the fall of Germany in 1945. Essen was founded in the 9th century, but its growth is comparatively recent. In the 17th century it was captured by the Dutch and the Spaniards. After 1813, it belonged to Prussia. Essen was bombed in World War I by French planes, and in World War II was an important target of Allied bombers. Essen is the seat of several industrial and mechanical schools, a school

of mines, and an agricultural school. Following World War II it was occupied by British forces. Population, *ca.* 650,000.

Essequibo (*ăs-să-kě'bô*), the largest river of British Guiana, rises in the Tumuc Humac Mts., and flows into the Atlantic near Georgetown. It has a course of about 600 m. and its estuary is 20 m. wide. Several tributaries flow into it, chiefly from the west, and the region through which it flows has fine forests of ebony, locust, ironwood, and greenheart.

Essex (*ěs'ěks*), the name of a U.S. frigate used in the War of 1812, then under command of David Porter. The *Alert*, a British sloop of war, commanded by Capt. Laugharne, attacked the *Essex* on Aug. 13, 1812, but was captured by its opponent. Later the *Essex* was attacked at Valparaiso, Chile, by two British men-of-war, the *Phoebe* and the *Cherub*, and her crew was forced to surrender. This engagement took place on Mar. 28, 1814.

Essex, ROBERT DEVEREUX, EARL OF, born in Herefordshire, England, Nov. 10, 1567; executed Feb. 25, 1601. He was schooled at Cambridge, entered military service in the Netherlands under his stepfather, the Earl of Leicester, and attained the special favor of Queen Elizabeth, who showed him many distinguished honors. Later he was sent to assist Henry IV of France against the Spaniards and rose rapidly to privy chancellor, earl, marshal, and chancellor of Cambridge. His activities in military affairs resulted in the capture of Cadiz in 1596, but his expedition in the following year was not successful and caused a quarrel with the queen, in which Essex became so excited that he drew his sword, threatening the



EARL OF ESSEX

life of the queen, and the two were never really reconciled. In 1599 he was appointed Lord Lieutenant of Ireland, and, after failing in satisfying his constituents, he led a band of 300 men to rid the country of Elizabeth's counselors, but especially those opposed to him personally. Being disappointed in obtaining general support, he was captured, tried for treason, condemned, and beheaded. For some time Elizabeth showed unwillingness to sign his death warrant, expecting him to implore her pardon, but his pride and dignity prevented this. He was a friend of literary men, gave an estate to Bacon, erected a monument to Spenser, and contributed some productions in poetry to English literature.

Estate (*ēs'tāt*), the interest which an owner may have in property, either real or personal. The term *fee simple* is applied where the ownership is absolute, so that the owner may encumber or sell it as he may choose. An estate in *fee tail* is one which is owned by the possessor, but he may dispose of it only to a class of heirs. A *life estate* pertains to the ownership of land, but the title is held only during the lifetime of the possessor. An *entail* is an estate settled on one person and his descendants.

In general, the term estate has reference to the degree, quantity, nature, and extent of interest which a person has in real estate. From this circumstance we speak of an estate in *expectancy*, in *remainder*, in *common*, in *reversion*, etc.

Estate Tax (*ēs-tāt' tāks*). See *Inheritance Tax*.

Estates of the Realm, in this sense *estate* refers to political or social groups or classes having a share in the government of a nation. The system of representation by the *three* main estates, the clergy, the nobility, and the commons, dates back to feudal days. In the British realm, parliamentary language terms the above three estates as *Lords Spiritual*, *Lords Temporal*, and *Commons*. The latter group constituted the "tiers état" or bourgeoisie during the French Revolution. With the industrial and commercial growth of nations the third estate emerged as an important power, often pitted against the other two estates. The phrase "fourth estate" denotes a powerful factor outside the accepted three estates; its meaning has changed with the times, once being applied to the mob, sometimes to the army, and especially since the 19th century, to the press, a vital influence on the modern political front. Although the phrase was used as early as 1660 by Lord Falkland in a British parliament speech, the press as the fourth estate was referred to by Macaulay in his "Hallam's Constitutional History" (1828).

Esters (*ēs'tērz*), or ETHEREAL SALTS, organic compounds which correspond to the salts of inorganic chemistry. They are compounds of alcohols or phenols which contain an —OH

group with acids which have a free H—, the HOH being removed as water, thus forming the ester. Glycerin is a higher-boiling alcohol which when combined with the fatty acids, such as oleic and stearic, produces common vegetable and animal fats and oils, which are mixtures of esters. The lighter esters dissolve the solid cellulose esters and ethers, and are used in large quantities in lacquers; ethyl acetate and butyl acetate are used as volatile solvents which evaporate, leaving a film of lacquer behind. Ethyl, butyl, and amyl phthalate do not evaporate, but remain in the lacquer film and make it flexible.

Esther (*ēs'tēr*), meaning a star, the Persian name of Hadassah, daughter of Abihail, and foster daughter of Mordecai, an officer of the Persian king, Ahasuerus. When the misconduct of Vashti had resulted in the loss of her royal estate, all the fair young virgins appeared before Ahasuerus that he might choose a successor. He selected Hadassah, who received the name of Esther on account of her loveliness.

Esther, BOOK OF, a book of the Old Testament, so named from Esther (*q.v.*). It recounts how Esther was raised to the position of queen by Ahasuerus, King of Persia, how she and her uncle Mordecai frustrated the plans of Haman to extirpate the Jews, how Haman was hanged and was succeeded by Mordecai, and how a festival was instituted to commemorate the deliverance of the Jews from their enemies. Recent critics think that it was written about 640 B.C. The language of the original manuscript is Hebrew, intermingled with numerous Persian words.

Esthetics. See *Aesthetics*.

Estonia (*ēs-tō-ni-ä*), a country of Europe, bounded on the north by the Gulf of Finland, east by Russia, south by Lithuania and west by the Baltic Sea. The area is 18,353 sq. m. It is largely an agricultural country and produces grain, hay, cattle, potatoes and dairy products. Before the invasion of the Germans in 1941, there were large textile mills and shipbuilding yards and the shale-refining industry was the largest of its kind in the world. Tallinn (population, ca. 147,000) is the capital. Formerly a part of Czarist Russia, Estonia established itself as a republic after the Russian Revolution of 1917. It remained independent of Russia until 1940 when Russian troops occupied the country. A one-party election was then held which resulted in a Communist Parliament. The parliament voted to join the U.S.S.R. and on Aug. 6, 1940, Estonia became a Soviet Socialist Republic. German troops captured Estonia in 1941 and were in control of the country until 1944. Population, ca. 1,126,500.

Estrogen (*ēs'trō-jen*), a commercial preparation containing estrone, the active principle of the female sex hormone which causes or regulates the secondary sex characteristics. Estrone is isolated

on a large scale from the urine of pregnant mares, and is marketed under various trade names and in various forms for subcutaneous, percutaneous, or oral administration. It may be used to offset post-climacteric involution changes which follow atrophy of the ovaries.

Estrone (*ĕs'trôn*). See *Estrogen*.

Etching (*ĕch'ing*), in art, a special type of engraving. Introduced at the beginning of the 16th century, the etching grew out of copper engraving. In contrast to the latter technique, etching requires a metal plate which is first covered with a wax mixture, then smoked with soot. On this black surface the artist draws with a steel needle. The plate then goes into an acid bath which bites out the engraved lines, leaving the wax covered areas intact. See also *Engraving*.

Eternal City (*ĕ-tĕr'nāl sīt'y*), name applied to Rome, Italy. The "first Rome," means the Rome of the ancient Roman empire, the "second Rome," Rome under the popes, and the "third Rome" is Rome as the capital of Italy.

Etesian Winds (*ĕ-tĕ'zhan*), the name of winds that prevail in the southern part of Europe during the summer season. They blow from the north and northeast across the Mediterranean, and are due to the sun heating the surface under the Tropic of Cancer, causing the air to be drawn in over the desert of Sahara. Though the air is charged with moisture in passing across the Mediterranean, the clouds are dispersed when they reach the margin of the hot sands and the vapor is dissipated in the rarefied air.



Courtesy Ewing Galloway, N. Y.

CITY HALL IN TALLINN, CAPITAL OF ESTONIA

Ethelbert (*ĕth'ĕl-bĕrt*), King of Kent, born about 545; died in 616. He succeeded his father in 560 and became the most powerful prince of the heptarchy. Christianity was introduced into Britain during his reign through the influence of his wife, Queen Bertha, who was a daughter of the King of Paris. At this time St. Augustine flourished in England and through his influence many conversions were made. The first Anglo-Saxon code of laws was published under Ethelbert.

Ethelbert, King of England, son and successor of Ethelwulf; died in 866. He succeeded his father in 857 and became sole king after the death of his brother Ethelbald, in 860. The Northmen invaded England during his reign and sacked Winchester and Kent.

Ethelred I (*ĕth'ĕl-rĕd*), King of England, son of Ethelwulf, died in 871. He succeeded his brother Ethelbert in 866 and immediately engaged in a war against the Danes, who invaded and conquered a large part of his kingdom. He was killed in a battle with the Danes, at Reading, and was succeeded by Alfred the Great. See *England*.

Ethelred II, King of England, son of Edgar, born about 968; died in 1016. He ascended the throne in 978 as successor of his brother, Edward the Martyr. He was called the Unready, because of his unwillingness to take counsel (*rede*). His reign was marked by numerous incursions of the Danes. In 1002 he ordered all the Danes in England to be executed, the victims probably including Gunhild, the sister of Sweyn, King of Denmark. The latter promptly invaded England and ravaged the country for four years. A second war with Denmark broke out in 1015, when Canute, son of Sweyn, overran a large territory.

Ethelwulf (*ĕth'ĕl-wŭlf*), King of the Anglo-Saxons, son and successor of Egbert, died in 858. He succeeded his father in 836 and most of his reign was disturbed by incursions of the Danes, who captured London in 851. Ethelwulf defeated the Danes at Okely, but they retained their settlement on the isle of Thanet. In 855 he visited Rome, where his son Alfred the Great received the sacrament of confirmation. On returning to England, he found that his son Ethelbald had usurped the kingdom. In order to appease him, he granted the latter the government of Wessex.

Ether (*ĕ'thĕr*), in astronomy and physics, the tenuous fluid that fills all space. It is regarded as the medium for the transmission of light, heat, and electric action, through the molecules of solids and liquids as well as throughout all gases. This medium is thought to be more elastic than any ordinary form of matter. Electric and magnetic phenomena are but strains and pulsations in the ether. Physicists assume the existence of ether from the wave theory of the motion of light (*q.v.*).

Ether, or ethyl ether, ethyl oxide, diethyl oxide, sulphuric ether, an alkyl or aryl oxide de-

rived from an alcohol by substituting another radical for the hydrogen of the hydroxyl group in the alcohol. The chemical formula is $(C_2H_5)_2O$. It is colorless, clear, highly volatile, and flammable. It boils at $35^\circ C$; its melting point is $-116^\circ C$. It was first prepared by Valerius Cordus in 1540. It is now prepared by heating ethyl alcohol with sulphuric acid at about $130^\circ C$, followed by distillation. Its vapors when mixed with air are explosive. Air oxidizes ether into ethyl peroxide, a reaction accelerated by sunlight. Ether peroxide is explosive above $100^\circ C$. Ether must be kept tightly sealed, in a cool, dark place, and away from fire at all times. It is slightly soluble in water, and miscible with alcohol, benzene, chloroform, and oils. It is used as a reagent and solvent for fats, alkaloids, resins, waxes, gums, and other organic substances; in the manufacture of smokeless powder, matches, dyes, collodion, artificial silk, pyroxylin products, plastics, photographic films, etc., and in medicine as a general inhalation anesthetic, analgesic, antispasmodic, and stimulant.

Ethics (*ēth'ik's*), the science which relates to human duty.

Ethics is the branch of philosophy which deals with morals, in the same way that aesthetics (*q.v.*) deals with beauty, and epistemology (*q.v.*) deals with the possibilities of human knowledge. It concerns, therefore, the compass, the nature, and the aims of our moral principles and the reason for their existence. Ethics investigates the reasons for and the forms of human conduct; what is right, what is wrong, and why a certain kind of behavior is right or wrong is the pivotal issue of this science. It is easy to imagine that the answer to it was given in very different ways by the various forms of society which existed at the various periods of history. Since the respective historical condition is of utmost importance as presupposition for an ethical system, ethics can never be a science like mathematics or astronomy, but it will always be a branch of philosophy. Even "moral actions" such as our evaluation of kindness, honesty, justice, which appear to us to be undebatable matters of fact, cannot be scientifically "proved." They can be conceived of as intuitive truths, as religious truths, or as injunctions of the various religious systems. Or they may be explained in an empirical way as rules for human behavior, developed out of the various forms of society and conditioned by them.

The history of ethics is as long and as manifold as the history of human thinking and the historical evolution of the various systems of philosophy. Strangely enough, when we begin to reflect on problems of moral philosophy, such as duty, or the freedom of the human will to determine what is good and what is bad, we discover that we are moving in a circle. Most of our ideas of the

supreme good are apparently innate in us.

The controversies in ethics refer less to these problems, which seem to be not problematical but *a priori* truths, than to "reflections" concerning the nature of moral consciousness. It is about the nature of moral consciousness that the various ethical systems have developed contradictory conceptions. It is obvious that our concept of the family, the state, the law, and social institutions depends to a great degree upon our concept of the nature of morality. This concept even influences our religious attitudes. No religious system is imaginable in which the Supreme Being does not at once represent the highest and purest idea of the highest good.

It has to be emphasized that there is a principal difference between ethics proper and moral philosophy. Ethics deals in a descriptive way with the qualities and the reasons for ethical behavior. Moral philosophy, however, deals with the rules of human behavior, and what it *should* be—in other words, ethics is an analytical, descriptive science, moral philosophy a prescriptive science.

Attitudes toward ethics depend on the general idea of the respective philosophical system. Listing these various attitudes through the whole history of philosophy (*q.v.*), we encounter some typical differences which may be best explained by examples taken from various periods. Even in Greek philosophy, which we are accustomed to consider as something of a unity, we find entirely contradictory concepts of ethics. The Sophists (*q.v.*) declare very simply that good is what is prescribed by the laws of the country—a concept which we would call today an socio-empirical one. Socrates (*q.v.*) explains the good as identical with the helpful and the practical. Plato (*q.v.*) terms virtue the highest good. Aristotle (*q.v.*) declares happiness (*eudaimonia*) as the highest good and the way to it the middle road between the extremes. The followers of Epicurus (*q.v.*) also consider happiness as the extreme good but believe that virtue and dedication to spiritual values are the best ways to achieve it. Thus, we see a continuous fluctuation even in Greek philosophy between the concept of ethical behavior as practical means to achieve satisfaction and happiness, and ethical behavior as the final goal of human life in itself. This is just one example of various concepts within only a limited historical period.

Christian concepts in the Middle Ages were equally at variance. Christian theologians have tried to systematize morality in accordance with the fundamental principles of Christian belief, and yet they differ widely. All of them, however, have, of course, one fundamental axiom in common, in contrast to the nonmonotheistic, pre-Christian doctrines: It is the axiom that God has revealed the Law in a written code, and that

moral behavior is determined by it. Divine commands regulate our behavior in all situations of life. Ethics are identical with knowledge and understanding of the will of God. Knowledge of the divine will is not knowable through reason, but is stated in the Old and New Testaments. Thus, differences in Christian concepts of ethics result only from distinctive efforts to arrive at a more or less correct comprehension of God's Law, never from an evaluation of the moral content of the Law. Obedience, purity, and humility—the Christian virtues—issue directly out of the Law. The fulfillment of the Law is based on "love"—love of God and love of one's brethren. Medieval Christian moral philosophy found its highest and clearest expression in the writings of Thomas Aquinas. It goes without saying that since all Christian ethical systems adhere to the fundamental axioms of Christian faith, they are more accurately defined in terms of moral theology than as independent ethical science. Jewish and Mohammedan ethics have basic concepts in common with Christianity, and definitely differ as much as Christian ethics do with the ethical systems of antiquity.

It is only with the Renaissance that ethics again becomes an independent discipline, emancipated from theology. The crisis of Western Christianity in the 16th century brought about a humanistic renewal of the search for independent principles. Grotius (1583-1645), Hobbes (1588-1679), Spinoza (1632-77), Locke (1632-1704), and Shaftesbury (1671-1713) are some of the earlier modern philosophers in whose philosophical systems ethics plays a major role. Hume (1711-76), Adam Smith (1723-90), and especially Kant (1724-1804), with his doctrine of the categorical imperative, are the 18th-century philosophers who exerted the greatest influence on later sociology and philosophy. With the German philosophers Schleiermacher (1768-1834), Hegel (1770-1831), and Schopenhauer (1788-1860), with Saint-Simon (1760-1825) and Comte (1798-1857) in France, with Bentham (1748-1832), J.S. Mill (1806-73), and Spencer (1820-1903) in England, the 19th century unfolds a variety of doctrines. These philosophers approached the fundamental problems in many different ways and tried to apply the ethical principles which they found in ethics proper to international law, social systems, and economics. At the end of the 19th century, psychological points of view and attitudes based on natural science begin to exert an increasing influence. See also *Behaviorism*; *Pragmatism*, and articles on contemporary philosophers.

Ethiopia (*ē-thī-ō'pī-ā*), also known as Abyssinia, a kingdom of Eastern Africa. Ethiopia (including Eritrea, an autonomous unit under the sovereignty of the Ethiopian crown) is bordered on the N. by the Red Sea, on the E. by French and

British Somaliland, on the S. by Kenya and the former Italian colony of Somaliland, and on the W. by the Anglo-Egyptian Sudan. Including Eritrea, the area of Ethiopia is about 321,000 sq. m.; population, ca. 13,000,000.

DESCRIPTION. Ethiopia may be described as an elevated plateau, its altitude being about 8,000 ft. Numerous mountain chains traverse the country, of which the Simen Mts. in the northern section are the most important. These mountains have an altitude of about 10,000 ft., while Ras Dashan, elevation 15,000 ft., may be regarded as the culminating peak. The Talba Wakha Mts. are located south of the predominating group and are less elevated, their highest peaks being about 9,000 ft. above the sea. The southern portion is less mountainous, but rocky hillocks characterize the surface.

Lake Tana is the largest body of water and the source of the Atbara, or Black Nile. It is located at an altitude of nearly 6,000 ft., and occupies an area of 1,150 sq. m. There is a general depression toward this lake. The chief rivers, besides the Atbara, are the Abai or Blue Nile, the Hawash, and the Takazee, a tributary of the Atbara.

Though wholly within the tropics, Ethiopia, owing to its elevation, has a temperate climate, and yields the usual products of the Temperate Zone. It is usually divided into three climatic areas: the regions below 4,800 ft., the sections between 4,800 to 9,000 ft., and the portions having an altitude above 9,000 ft. There are two seasons, the rainy and the dry, and the precipitation is greatest from June to September. From October to April, at Gondar, 7,420 ft. above the level of the sea, the average temperature is 68° F., while the temperature in more elevated sections ranges from 45° to 50° F. The soil is well adapted to the cultivation of the hardier cereals, and the climate is generally healthful.

INDUSTRIES AND RESOURCES. Agriculture is the chief industry, though the methods of farming are primitive. Coffee, barley, wheat, hides, and wax are the chief products; oranges, lemons, mangoes, and grapefruit are grown in small quantities. Minerals include gold, platinum, mica, and copper. Contrary to the belief that prevailed at the time of the Italian invasion, petroleum has not been discovered in Ethiopia, and it seems unlikely that the country possesses any important deposits. Manufacturing is primitive and on a small scale. Wild animals, including the zebra, hyena, lion, wolf, leopard, buffalo, and elephant, infest the forests and mountains, and in the regions of streams and lakes the rhinoceros and the hippopotamus abound. The chief exports include coffee, wax, gold, hides, and grain, while the imports embrace textiles, clothing, glassware, building materials, and salt. Ethiopia has extensive mineral resources that will some day make it one of the



ADDITION TO ETHIOPIAN EDUCATION

Emperor Haile Selassie (*right*) and U.S. Ambassador George R. Merrell attend the opening of a new U.S. educational center in Addis Ababa



MARKET DAY IN ADDIS ABABA

The crowded open-air markets of the capital city attract the natives from the surrounding countryside (*picture courtesy Ewing Galloway, N. Y.*)

most productive countries of the world.

A railroad 488 m. long extends from Djibouti, French Somaliland, on the Gulf of Aden, to Addis Ababa. Other communications include 6,500 m. of motor road, and some 6,000 m. of telephone and telegraph lines.

EDUCATION AND RELIGION. There are about 6,000,000 Coptic Christians and around 7,000,000 Mohammedans in Ethiopia. The Falashas, or black Jews, number about 50,000. The official church, the Coptic Church, is under the leadership of the *Abuna* (head bishop). The Mohammedan population is concentrated in the north-western part of the country and around the old Mohammedan town of Harrar.

Since the country's liberation from Italian occupation, during which all schools founded by Haile Selassie were closed, Ethiopia has made great strides in education. Grammar schools and high schools were founded and in 1950 the emperor laid the cornerstone for a university in Addis Ababa. The government also undertook plans to send about 200 students to the U.S. annually. The large masses of people, however, are still illiterate.

GOVERNMENT. The government is a constitutional monarchy, and the reigning sovereigns for centuries trace their lineage back to the Queen of Sheba, who visited Solomon, King of Israel, to witness his magnificence and power. Haile Selassie I, the present emperor or Negus Negesti, is the 324th monarch with the official title of "King of the Kings of Ethiopia and Conquering Lion of Judah." He was driven from his throne by the Italian invasion armies in 1936, and between that

year and 1941, government was officially vested in the King of Italy who was proclaimed Emperor of Ethiopia. After Italy declared war on Great Britain in 1940, British troops occupied the country. Haile Selassie returned to Addis Ababa on May 5th, 1941, and re-established a sovereign Ethiopian state. The chief cities are Addis Ababa, Gondar, Adowa, Harrar, and Ankober. Harrar is the leading commercial center.

HISTORY. Ethiopia, the Cush of sacred history, was the ancient name applied to all the nations inhabiting the Southern Hemisphere, as known in early ages. However, some writers applied to the dark-brown or black-colored people the name Ethiopians, meaning "sunburned." Later it had reference particularly to the country lying south of Egypt and the Red Sea, which corresponded to modern Abyssinia, Nubia, Kordofan, and other districts, though the boundary was not clearly defined. It was also applied to an island formed by two tributaries of the Nile, known as the kingdom of Meroë, whose capital was Napata. This island was fertile, producing an abundance of cereals, animals, and metals. It was the site of an oracle of Jupiter Ammon. Ethiopia, as a country, had a large trade with Egypt, Libya, Carthage, Arabia, and even India, but it attained its greatest prosperity about 1000 B.C., and formed a distinguished and powerful kingdom of ancient history. About the middle of the 8th century B.C. it became independent of Egypt, obtained a predominating influence in the valley of the Nile, and imposed a dynasty upon Lower Egypt.

The Persian Cambyses invaded Ethiopia in the 6th century B.C., though independence was main-

tained until it became a possession of the Romans in the reign of Augustus, the Ethiopian queen, Candace, becoming one of his vassals. The only evidences remaining of the ancient civilization of Ethiopia are numerous ruins of monuments and temples on which battles, religious ceremonies, and the industries are represented by sculptures. Their first king was Menelik, who is supposed to have been the son of Solomon and the Queen of Sheba. The names of 30 kings and queens have been found sculptured on some of the ruins. The language of the Ethiopians, more correctly called the Geez language, was introduced from South Arabia, and formed the ancient ecclesiastical and official language of Abyssinia. Semitic in construction, it resembles the Hebrew, Aramaic, and Arabic. The modern nomadic tribes of the Sudan and Tigré speak a language closely allied to it.

Christianity was first introduced during the 4th century. It was followed by the spread of Mohammedanism near the end of the 6th century. During the latter period the country relapsed into a primitive, half-barbarous civilization that lasted until the 14th century. The Portuguese were active in the country during the 16th century and originated the name Abyssinia, signifying a mixture of people from many tribes.

Sir Robert Napier invaded the country with a British army in 1868 and King Theodore committed suicide, after having met with a thorough defeat. He was succeeded by King John, who fell in battle with the Dervishes of the Sudan in 1889. His successor, Menelik II (died in 1913), was a good ruler. Italy claimed a protectorate over the kingdom under the Treaty of Uchali in 1889, but this was set aside in the Treaty of Addis Ababa in 1896 after an invading Italian army had suffered a humiliating defeat at Adowa. By the latter treaty the independence of the country was recognized. The king modernized the government in 1907 by establishing a cabinet of ministers, including those of finance, foreign affairs, war, justice, and commerce.

Under Empress Zeoditu, who came to power in 1916, Ethiopia remained neutral throughout World War I, and during the reign of the empress the country underwent further modernization. The trade in slavery was abolished shortly before Ethiopia became a member of the League of Nations in 1923. At the death of the empress in 1930, Ras Tafari, known as Emperor Haile Selassie, succeeded to the throne. Italy (*q.v.*) invaded the country on Oct. 3, 1935, and on May 9, 1936, annexed Ethiopia to the Italian empire in spite of opposition from the League of Nations and the leading countries of the world.

In March 1941, Ethiopia was reconquered by the British and Haile Selassie restored to his dominions. Ethiopia declared war on the Axis

Powers on Dec. 14, 1942, and became a member of the United Nations. After his restoration, the emperor agreed to restore the 1931 constitution and to keep in force the Italian decrees abolishing slavery and forced labor. With the help of British loans and advisers, the country's economic conditions returned to normal, and in 1947, Ethiopia rejected UN aid for reconstruction, holding that it was more urgently needed by other countries. In 1950 the U.N. General Assembly approved a plan whereby Eritrea (*q.v.*) would constitute an autonomous unit federated with Ethiopia under the sovereignty of the Ethiopian crown.

Ethmoid Bone (*ěth'moid bōn*), in anatomy, one of the eight bones which form the cranium (*q.v.*). It is located between the eyes and the root of the nose and is perforated, sievelike, by a number of small holes through which certain nerves pass.

Ethnography (*ěth-nōg'rá-fy*), a descriptive science which deals with ecological, social, cultural, and psychological aspects of human groups.

Ethnology (*ěth-nōl'ō-gy*), a branch of anthropology which deals with the living cultures of mankind in all their variety. The term culture as used by anthropologists refers to the more or less organized and persistent patterns of habits, ideas, attitudes, and values which are passed on to the new-born child from his elders or by others as he grows up. Culture sets the main framework within which the individual learns to behave as a member of his society. The ultimate aim of the ethnologist is to understand how societies and cultures operate and why and how cultures change. See *Anthropology*.

Ethyl (*ěth'yil*), in chemistry, an organic radical, derived theoretically from ethane C_2H_6 , by the removal of one hydrogen or from ethyl alcohol C_2H_5OH by the removal of hydroxyl. It does not exist by itself, but, acting as a unit, forms part of many organic compounds.

Ethyl Chloride (*ěth'yil elōr'id*), C_2H_5Cl , a volatile liquid which vaporizes so easily that it absorbs heat from its surroundings and causes freezing. It is produced by passing alcohol vapor and hydrochloric acid over zinc chloride and cooling. It condenses at $12.5^\circ C$. It is used as an external local anesthetic; in quantity for the production of ethyl ethers of polyalcohols, chiefly cellulose to produce cellulose ether; in refrigeration; and as a solvent.

Ethylene (*ěth'y-lēn*), ETHENE, or "OLEFIANT GAS." An unsaturated hydrocarbon C_2H_4 , which may be liquefied under high pressure and low temperature. It is prepared from alcohol by passing the vapors over phosphoric acid and purifying the gas, and then compressing it into cylinders. It is a by-product of the cracking of petroleum. It has been used as a base for the production of glycols and alcohols. The pure gas has also

been used in anesthesia. When ethylene gas is dissolved in strong sulphuric acid, on dilution, ethyl alcohol is produced. Ethylene gas combines directly with chlorine to produce ethylene dichloride. When this is reacted with sodium polysulfide, a synthetic rubber "Thiokol" is produced. Ethylene is also used to hasten the ripening of fruits; when mixed with air and ignited, it is violently explosive.

Etiolation (*ê-tî-ô-lâ'shûn*), the process of bleaching plants by excluding the light of the sun. It is made use of in bleaching celery, by which the plant becomes quite tender and less acid. Plants subjected to etiolation for some time become pale and almost colorless, since no chlorophyll (*q.v.*) is produced in the absence of sunlight.

Etna (*ê't'nâ*), a borough in Allegheny County, Pennsylvania, on the Allegheny River, opposite the city of Pittsburgh. It is on the Pennsylvania and the Baltimore & Ohio R.R.'s. It has furnaces, rolling mills, and machine shops. Etna was incorporated in 1868. Population, 1950, 6,750.

Etna, or **AETNA**, the most celebrated volcano in Europe, situated in Catania, Sicily, towering 10,865 ft. above sea level. This mountain rises abruptly from the sea, having a circumference of over 100 m. at the base, and ends in a single cone, in which a crater nearly 3 m. in circumference and 1,000 ft. deep has been formed. A number of smaller cones are situated on the side of the mountain, the principal one being Monte Rossi, formed during the eruption of 1669. The mountain contains three climatic zones—the lower mild region, the central temperate, and the upper or snow covered. In the milder regions many varieties of lemons, oranges, date palms, olives, almonds, figs, and bananas are cultivated. The temperate belt has forests of oak, birch, chestnut, cork oak, maple, and pine, and in the upper part is a desert region covered partly with stunted vegetation and partly with ashes, lava, and sand, and much of it is buried most of the year with snow. A splendid view of the whole of Sicily, Malta, Calabria, and the Lipari Islands is obtained from the summit. At the height of 9,080 ft. is an observatory, which is one of the highest inhabited structures of Europe.

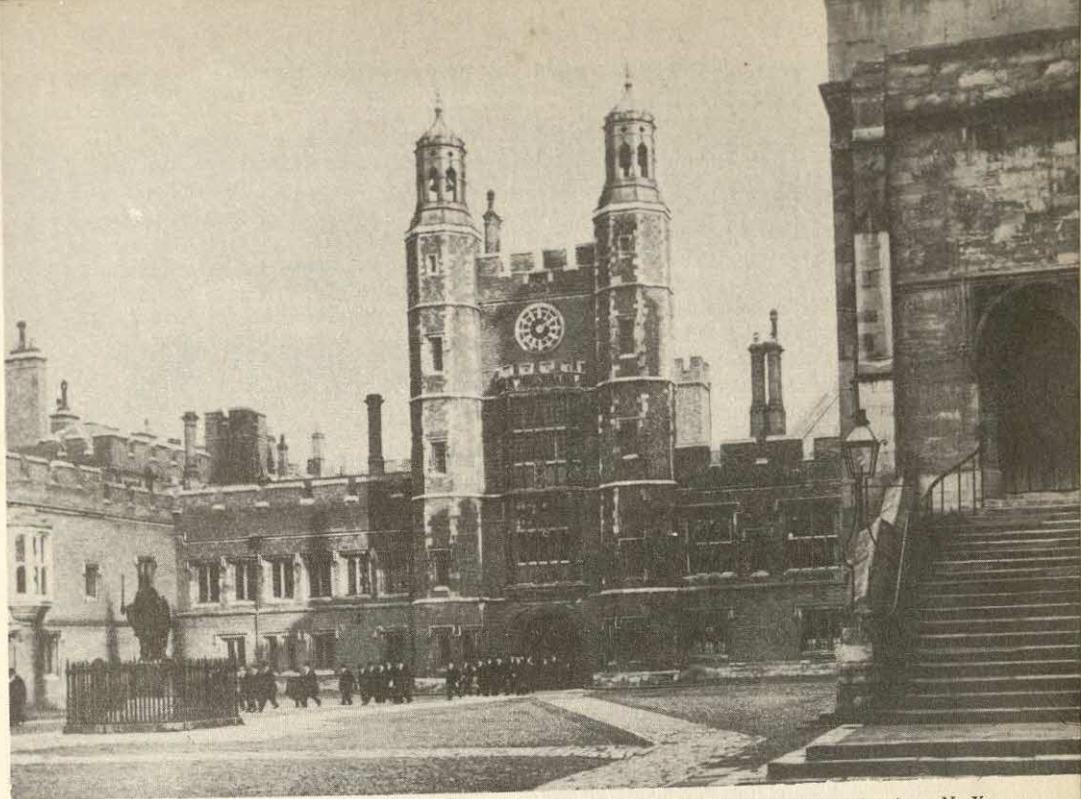
Several great eruptions of Mt. Etna occurred long before the Trojan wars, according to the legends of the ancients. The earliest to which a definite date is given occurred in 475 B.C. and the most remarkable overwhelmed Catania in 1169, when 15,000 persons were destroyed. In an eruption in 1329 a new crater opened. About a century later, in 1444, a large cone formation fell into the crater during an eruption, and in 1669 a chasm 12 m. long burst open and lava flowed over the country for 40 consecutive days. An earthquake accompanied the eruption in 1693 and

took 60,000 lives. Vast eruptions occurred in 1832, 1853, 1865, 1874, 1879, and 1923. Many less violent explosions have occurred at different times, numbering in all about 100, fully 20 of which occurred in the 19th century. Premonitory symptoms generally precede eruptions, thus giving ample warning to the people that danger is imminent.

Eton College (*ê'tûn eöl'êg*), a public school in the English sense (a private boarding school), situated in Eton, England, about 20 m. from London. It was founded by Henry VI in 1440. The institution is managed by a board or governing body. The most remarkable feature of the buildings is the 15th century chapel, one of the finest examples of Perpendicular architecture in England. Associated with the buildings are libraries, apparatus, a beautiful campus, and several parks. The attendance numbers about 1,100. Latin is a compulsory study for all boys up to the age of 16, but Greek is not compulsory, and students are permitted to study a variety of modern subjects. Among its distinguished graduates are Fielding, Chatham, Channing, Gray, Hallam, Wellington, Shelley, Gladstone, Balfour, Keynes, Halifax, Eden, Dalton, and Strachey. Eton and Harrow (*q.v.*) are the classic examples of the English public school.

Etruria (*ê-trôô'rî-â*), the ancient name of the portion of Italy which is situated south of the valley of the Arno and west of the Tiber and the Apennines. In its greater prosperity it embraced the valley of the Arno, extending south of the Tiber, when it included the valley of the Po. For practical purposes it may be said that Etruria corresponded to modern Tuscany, but included several adjoining regions. The traditional history of Etruria begins about 1044 B.C., and its fairly authentic history precedes the foundation of Rome more than two centuries. The state was formed as a confederation of 12 great cities or cantons, each of which constituted a representative republic. Among the most flourishing of these cities were Cortona, Veii, Caere, Volsinii, Tarquinii, and Perugia. Veii was a rival of Rome for four centuries, and in its prosperity covered 16 sq. m., but was destroyed under Camillus in 396 B.C. The famous tomb of the Tarquins is located at Caere. Volsinii resisted Roman attacks for many years and constituted one of the most powerful centers of Etruscan strength.

The naval power of the Etruscans was a strong element in their prosperity, enabling them to control large portions of the Mediterranean, establish supremacy over central and northern Italy, and include Rome itself within their territory for several centuries. From them the Romans derived the circus, many arts of industry, architectural methods, and the gladiatorial combats. They formed an alliance with the Carthaginians in 538



Courtesy British Information Services, N. Y.

ETON COLLEGE

B.C. for the purpose of expelling Greek colonists from Corsica, fought against the Greek colony of Cumae in 525 B.C., and were rated the greatest military power of Italy in 467 B.C., though two years later their strength was partly shattered by the Greeks. Subsequently their territory was invaded by the Gauls, Samnites, Greeks, and Romans. The Roman victory over Veii in 396 B.C. completely destroyed Etruscan power, while their last determined resistance ended at the Battle of Lake Vadimonian in 283 B.C. Even after this their state was considered an independent ally of Rome, though Roman customs were gradually adopted until the final union was effected in 89 B.C., after which many of the leading families of Etruria attained to high positions in the Roman government.

The name applied to the people of Etruria by the Romans was *Etrusci*, while the Greeks called them *Tyrrheni*. These people constituted a sturdy race. They were characterized by black hair, a dark color, and a large head, and more nearly resembled the people of Western Asia than the Europeans. Their civilization was marked by culture, a definite literature, codified laws, and a flourishing commerce. Although their poems, dramas, and histories are numbered among the extinct writings of the past ages, we know something of their ability to compound and apply medicine, calculate mathematical and astronomi-

cal problems, mine and work metals, build highways, and construct architectural edifices by studying their ruins and deciphering the inscriptions found on monuments and in the tombs.

Many products of the Etruscans are extant, such as vases, lamps, and utensils. The vases made by this race are especially noteworthy, being ornamented by bands of beautiful foliage and figures of a highly artistic character. It is known from excavations that their homes were adorned with decorated walls, mirrors, jewelry, pottery, and convenient furniture, though in art they borrowed largely from the Greeks. Many of the exquisitely painted vases known and preserved as Etruscan were undoubtedly the production of Grecian workmen, for the reason that many of the inscriptions are in the Greek. The language of the Etruscans is known as Rasena and was spoken for about 1,000 years before the Christian era, when it gave way to the Latin. Numerous coins and gems bearing inscriptions in Rasena are extant.

Etruria, a kingdom founded in Italy by Napoleon I in 1801. It comprised the territory of Tuscany and was governed by the Bourbons of Parma until 1808, when it was incorporated into the empire of France. Elise Bacciocchi, a sister of Napoleon, was made Grand Duchess of Tuscany in 1809, but it reverted to Ferdinand III after the fall of Napoleon in 1814.

Etty (*ē'tī*), WILLIAM, painter, born at York, England, Mar. 10, 1787; died Nov. 13, 1849. He was apprenticed to a printer in Hull and studied painting at the Royal Acad. in London. Subsequently he traveled in Europe, visiting the art galleries of Paris, Venice, and Florence. In 1828 he was made a member of the Royal Acad. in recognition of his painting entitled "Pandora Crowned by the Seasons." His work has been criticized on account of many features being copied, though the composition and coloring have been commended. Among his chief works are: "Head of a Cardinal," "Ulysses and the Sirens," "The Combat," "Joan of Arc," and "David's Chief Captain."

Etymology (*ē-tī-mōl'ō-jī*), that branch of philology which treats of the origin, form, and meaning of words. Numerous Greek philosophers, including Plato, the grammarians of Alexandria, the Roman Varro, and scholiasts of different ages, wrote on etymology and traced the origin and history of particular words and forms of language. In more recent times the intense interest given to the investigation of Sanskrit has led to its scientific study. By means of extended investigations language has been classed in groups and families and the similar and dissimilar words have been studied from the standpoint of relationship and origin. This has led to a recognition of the fact that the growth of language is not accidental or premeditated, but enlarges or declines under certain laws. In grammar etymology is the division which treats of the parts of speech, their inflections, and the elements of the sentence.

Euboea (*ū-bē'ā*), an island of the Aegean Sea, formerly called Negroponte. It is 90 m. long and 30 m. broad at its widest point, and is the largest island in the Aegean Sea. The narrow channels of Talanti and Egripo (*Euripus*) separate it from Greece. Much of the surface is fertile and well wooded, though several mountain peaks rise to a height of about 7,000 ft. Chalcis and Karysto are the principal towns and trading centers. Besides minerals, the island produces livestock, cereals, and fruits. Euboea was settled by the Ionians in 1100 B.C., after which it became the home of Aristotle and the seat of the Euboean school of philosophy. Athens subdued it after the Persian wars and it became a possession of the Turks in 1470. It is now a province of the kingdom of Greece. Population, ca. 146,000.

Eucalyptus (*ū-kā-līp'tūs*), a genus of trees, mostly native to Australia, which grow as high as 480 ft., and form one of the most characteristic features of the vegetation in that part of the world. The leaves, instead of having one of their surfaces toward the sky, often grow with each side equally exposed to the light. Many of the species abound in resinous secretions and are known as gum trees. The bark is thick and hard,

containing a large percentage of tannin. In the red gum, bay king, and iron bark species, a red juice flows freely from a wound and hardens into irregular, inodorous, transparent masses called *eucalyptin*, which is analogous to tannin. The wood is used extensively for shipbuilding. A species of the eucalyptus known as the blue gum tree has been introduced into Cape Colony, Algeria,



Courtesy Australian News & Information Bureau, N. Y.

EUCALYPTI

These trees rise straight for 150 ft. or more before the first branch appears

Mexico, the Roman Campagna, and elsewhere. The climate and soil of many parts of California and Florida are well fitted for the cultivation of the eucalyptus tree, and it has been introduced there with good results. It has acquired a reputation for drying marshy soils and absorbing malaria, on account of which it is called the fever tree. A saccharine substance similar to sugar, a powder having the qualities of quinine, and a secretion resembling manna are obtained from these trees.

Eucharist (*ū-kā-rīst*), HOLY, term signifying the Lord's Supper as it is symbolized in the Blessed Sacrament of the Holy Mass. The word is derived from a Greek word meaning thanksgiving or blessing. The account of the institution of this sacrament is given in the Gospels (Matthew 26:26 ff., Mark 14:22 ff., and Luke 22:18 ff.). It is not contained in the Gospel of St. John, but the promise of the institution of the sacrament is given in great detail in his Gospel 6:48-65. The tradition of Christianity holds that in this sacrament the body and blood, soul and divinity of

Jesus Christ are really and truly substantially present. Most modern non-Catholic commentators, while denying the divine origin of St. Paul's teaching on the Eucharist, admit that his teaching allows of no other logical interpretation. This sacrament is brought into being at the words of consecration in the Sacrifice of the Mass. Because Jesus Christ is really and truly present in the Eucharist, this sacrament is worthy of all the adoration due to God in the teaching of Catholics. His entire presence is under bread or wine, but only the Host is reserved in the tabernacle. The wine to be consecrated must be pure wine of any kind from the grape, and the bread must be wheat bread leavened or unleavened. At the time of the Reformation, the doctrine of transubstantiation (*q.v.*) was denied, and the Protestants generally held that Christ became present in the bread only at the moment of reception through an act of faith on the part of the receiver. The Anglican Church at first denied the efficacy of the Mass and practiced a Communion Service, without reserving the Eucharist. In recent times, however, some High Church Anglicans have returned to the practice of reservation of the sacrament. Because this sacrament may not be consecrated except by a priest, duly ordained by a successor of the Apostles, Roman Catholics claim that Anglican reservation of the sacrament is invalid because their succession of bishops ceased with the Reformation. The Eucharist of the separated Orthodox Churches of the East, however, is regarded by them as valid.

Eucharistic Congress (*ū-eq-ris'tie cōn'grēs*), INTERNATIONAL, an institution of the Roman Catholic Church. After the first meeting in Lille, France, in 1881, international meetings have taken place at certain intervals. The aim of the congresses is to bring together prominent representatives of the Roman Catholic Church, thus encouraging devotion to the *Holy Eucharist* or *Lord's Supper* (*q.v.*).

Euchre (*ū'kēr*), a game of cards played by two, three, or four persons. Only the aces, kings, queens, jacks, tens, nines, and eights are used. The cards rank in the order named, except that the trump suit jack is called the *right bower*, which is the highest, while the jack of the next suit which is like in color is called the *left bower*, and hence is the second highest card. The game is one of the most popular played with cards.

Eucken (*oik'ēn*), RUDOLF CHRISTOPH, philosopher, born in Aurich, Germany, Jan. 5, 1846; died Sept. 15, 1926. Eucken began teaching in secondary schools, but in 1871 was appointed to the faculty of the Univ. of Basel. Three years later he went to the Univ. of Jena, where he remained until his retirement in 1920. Eucken's philosophical approach was one of idealism and metaphysics, his writings dealing largely with

problems of religion and general human culture. He published his first important book in 1901, "The Truth Told about Religion." In 1907 he produced "Christianity and the New Idealism" and "The Main Problems of Philosophy of Religion of Present Time." By this time his philosophical writings had been widely recognized, and in 1908 he was awarded the Nobel Prize for literature. Eucken's books which have been translated into English include: "The Problem of Human Life" (1910), "Religion and Life" (1911), "Life's Basis and Ideal" (1911), "Main Currents of Modern Thought" (1912), "Knowledge of Life" (1913), and "The Individual and Society" (1923).

Euclid (*ū'klīd*), Greek mathematician, born in Alexandria, Egypt, about 300 B.C. He belonged to the Platonic school of philosophy and taught mathematics in the famous Univ. of Alexandria, in the reign of Ptolemy I, where he made prodigious advancement by his vigorous methods. His "Elements of Geometry," published first in 13 and later in 15 books, has, perhaps, never been excelled.

Eudiometer (*ū-dī-ōm'ē-tēr*), an instrument used to determine the composition of gases. Priestley invented an apparatus of this kind to analyze atmospheric air and determine its proportion of oxygen. Many forms of the eudiometer are now in use, but the kind employed most extensively is a U- or V-shaped graduated glass tube, one end of which is closed and provided with electrodes fused into the glass. The air is tested by removing the carbonic acid contained in the air within the tube by means of a strong liquor potassae over a mercury bath, when the proportion of carbonic acid in the atmosphere is indicated by a rise of the mercury within the tube. An electric current is used, by means of the electrode, to explode a given quantity of hydrogen introduced in the tube. The volume of free oxygen in the tube is determined after cooling, and is equal to one-third of the loss of gas in the explosion. It is necessary to use a very thick tube in order to withstand the shock.

Eufaula (*ū-fū'lā*), a city of Barbour County, Alabama, on the Chattahoochee River, 80 m. S.E. of Montgomery. It is on the Central of Georgia R.R. The surrounding country is agricultural and fruit growing. It has manufactures of cotton goods, utensils, canned fruit, lumber, and tobacco. Population, 1900, 4,532; in 1920, 4,939; in 1940, 6,269; in 1950, 6,906.

Eugene (*ū-gēn'*), county seat of Lane County, Oregon, 125 m. S. of Portland. It is finely situated on the Willamette River and the Southern Pacific R.R., and is surrounded by a fertile farming and fruit-growing country. The Willamette River furnishes excellent water power for manufacturing purposes. Among the manufactures are: leather, lumber, furniture, brick, wool, and flour.

It is the seat of the Univ. of Oregon. The first settlement in its vicinity was made in 1854, and it was incorporated in 1864. Population, 1900, 3,236; in 1940, 20,838; in 1950, 35,879.

Eugène, FRANÇOIS, Prince Eugène of Savoy, general, born in Paris, France, Oct. 18, 1663; died in Vienna, Austria, Apr. 21, 1736. Being the son of Eugène Maurice, he was intended for the Church, but renounced his country on account of the banishment of his mother by Louis XIV, and entered the service of Emperor Leopold of Austria as a volunteer in the army sent against the Turks. His distinguished service caused his rapid promotion, and in 1693 he was made field marshal. Four years later he defeated the Turks in the Battle of Zenta, by which their power in Hungary was broken. When the Spanish War of Succession broke out, in 1701, he took a command in the army of Italy, but did not achieve much success because his force was too small. Shortly after, he entered the imperial army of Germany and, in conjunction with Marlborough, in 1703, defeated the French. These commanders defeated the combined army of the French and Bavarians under Marshal Tallard at Blenheim on Aug. 13, 1704. He forced the French to raise the siege of Turin, Italy, the following year, and soon after expelled their forces from Italy. In 1708 he attained much success on the field of Oudenarde against the French, and again at Malplaquet in 1709, though at the latter place he was dangerously wounded. He defeated a Turkish army of 150,000 at Peterwardein and, in 1717, stormed Belgrade, gaining a decisive victory.

Eugenics (*û-jên'iks*), a social movement which seeks acceptable means for improving the hereditary endowment of the human race. Recent developments in differential psychology, the study of population, and the science of genetics, have advanced eugenic thinking. It is now recognized that hereditary differences within specific social or racial groups are greater than the differences between the average of hereditary qualities in different groups. Eugenics is therefore mainly concerned with increasing size of family among the better individual strains in whatever social class or race they may be found, and decreasing size of family among the poorer individual strains. Eugenic proposals are not only eugenically desirable, but also have other social values. The sterilization of defectives, for instance, would decrease defective strains and also relieve society of the heavy burden of caring for defectives. Decrease of size of family among incompetent parents would tend to improve the hereditary average and would also relieve society of a social burden.

Eugénie (*û-zhâ-nê'*), MARIE DE MONTIJO, Empress of France, born in Granada, Spain, May 5, 1826; died July 11, 1920. Descended from Spanish

and Scotch parents, she was educated in Spain, France, and England, and attained to numerous accomplishments. Louis Napoleon, afterward Napoleon III, first met her in London, when he was there in exile. She went to Paris in 1851 and



Courtesy Metropolitan Museum of Art, N. Y.

EMPERESS EUGÉNIE

attracted the attention of the leading families, and on Jan. 30, 1853, married Napoleon. She fled to England when France was defeated, in 1870, and was joined by her son and husband. Three years after removing to England Napoleon died, and her only son, the prince imperial, born Mar. 16, 1856, was killed in the Zulu War in South Africa in 1879.

Eulenspiegel (*oi'lên-spê'g'l*), TILL, the name of a German prankster of the 14th century. The book called "Eulenspiegel," meaning Owl's Mirror, so named in his honor, purports to contain his numerous whimsical stories in which the love of fun is mingled with a profound love of mischief. He was utilized by the composer, Richard Strauss, as the principal figure of his symphonic poem, "Till Eulenspiegel's Merry Pranks," first performed in Cologne, Germany, in 1895.

Euler (*oi'lêr*), LEONHARD, mathematician, born at Basel, Switzerland, Apr. 15, 1707; died Sept. 7, 1783. He studied at the Univ. of Basel, from which he was graduated in 1723, and subsequently studied theology and medicine. In 1733 he became professor of an academy in St. Petersburg, and seven years later was called to Berlin by Frederick II as professor of mathematics in the Acad. of

Sciences. He returned to St. Petersburg in 1766, where he remained a potent factor in educational work until his death. His more important work consists of improving the integral calculus and science of mechanics.

Euler-Chelpin (oi'lēr chēl'pīn), HANS KARL AUGUST SIMON VON, chemist, born in Augsburg, Germany, Feb. 15, 1873. Educated in Sweden, he began his career as chemist in 1899 at the Univ. of Stockholm as lecturer, serving there, 1906-41, as professor (after 1941 professor emeritus) of general and organic chemistry. Interested in biochemistry and the chemistry of fermentation, he established the existence of cozymasis, brought the processes of sugar fermentation into line with the laws and methods of physical chemistry, and has done extensive research on vitamins. In 1929, Euler-Chelpin and Sir Arthur Harden (*q.v.*) were awarded the Nobel Prize in chemistry for their research in sugar ferments and the enzymes acting in this connection.

Eunuch (yū'nūk), in medicine, a male whose genital organs have been removed or mutilated to such a degree that he is impotent. Eunuchs were used in the East (at the Byzantine court, in the Mohammedan world, and even in China) to guard the apartments of the women of the ruler. They were also employed as singers, first in papal choirs and later (as *castrati*) in Italian opera until the end of the 18th century.

Eupen (oi'pēn), a town in the Province of Liège, Belgium, capital of the district of Eupen. In 1815, Prussia acquired the districts of Eupen and Malmédy (*q.v.*) on the Prussian-Belgian border by the Treaty of Vienna. The tiny district of Moresnet, a few miles southwest of Aachen, Germany, had been overlooked by the Vienna Treaty, and became a neutral triangle on the Belgian-Prussian border. In 1919, the Versailles Treaty transferred Eupen-Malmédy-Moresnet to Belgium. Belgium thus acquired 384 sq. m. and 63,692 additional population. During World War II the Germans held Eupen-Malmédy-Moresnet between May 19, 1940, and Sept. 12, 1944.

Eupen (population, *ca.* 13,500) has textile factories, iron foundries, machine shops and tanneries, and is a railroad junction. Malmédy, capital of Malmédy district (population, *ca.* 5,000) concentrates on leather-making.

Euphrates (ū-frŭ'tēs), an important river of Western Asia, rising by two head streams in the Anti-Taurus range, in Armenia. The western branch, known as Kara-su, rises about 25 m. N.E. of Erzerum and joins the Murad Chai, the eastern branch, some distance to the S. W. of that city. The great river is joined by the Tigris at Kurna, and the united streams take the name of Shat-el-Arab for the remaining distance to the Persian Gulf, into which its waters flow. The total length of the Euphrates is 1,740 m., and the area of its basin

is 260,000 sq. m. It is navigable about 1,200 m., though large warships cannot safely ascend farther than 125 m., owing to rapids and shallows. During May and June vast floods are caused by the melting snows on the Taurus and the Anti-Taurus ranges, causing the current to rise in velocity from 3 to 5 m. an hour and often occasioning great floods. The Bible (Genesis 2:14) mentions the Euphrates as one of the four rivers of the Garden of Eden.

Eurasia (ū-rā'sh-ā), the region included in the two continents of Europe and Asia. The term *Eur-Asiatic* is frequently applied to the geological formations of the two continents. In like manner, *Eurasian* has reference to both Europe and Asia, as the Eurasian plain.

Eurasians (ūr-ā'zhānz), the name applied to persons of mixed European and Asiatic descent.

Eure (ēr), a river of France, rises in the department of Orne, and flows into the Seine after a course of 115 m. It receives the inflow from the Iton, its principal tributary, and is navigable about 50 m.

Eureka (ū-rē'kā), the exclamation of Archimedes when he discovered a method of detecting the exact amount of alloy in the crown of King Hiero, the meaning being "I have found it." The word is now used to signify an expression of triumph at the time of making a discovery.

Eureka, county seat of Humboldt County, Cal., on Humboldt Bay, 294 m. N. of San Francisco. It has a good harbor and is on the Northwestern Pacific R.R. The city-owned Sequoia Park contains a tract of virgin redwood forest. Among the manufactures are dairy products, lumber products, woolen goods, and machinery. It has a large export trade in wool, lumber, fruits, butter, and fish. It was settled in 1850 and incorporated in 1856. Population, 1940, 17,055; in 1950, 23,058.

Eureka, a city in Juab County, Utah, 65 m. S. of Salt Lake City, on the Denver & Rio Grande and the Los Angeles & Salt Lake R.R.'s. It is surrounded by a productive gold, silver, and lead mining district. Near the city is a canyon of the Oquirrh Mts., which is noted for its valuable silver mines. Population, 1940, 2,292; 1950, 1,318.

Euripides (ū-rīp'ī-dēs), Greek dramatist, born in Attica *ca.* 480 B.C.; died in Macedon *ca.* 406 B.C. He was trained in gymnastic exercises and rhetoric under Prodicus and in philosophy under Anaxagoras (*q.v.*) and formed a close friendship with Socrates (*q.v.*). Most of his life was spent in Salamis. Writers credit him with completing his first play at 18, though "The Daughters of Peleus," his first known work, was written in 455 B.C. The first prize in the annual competition of dramatists held at Athens was awarded to him in 441 B.C. and the last was for the "Orestes," in 408. Of the three great Greek tragedians he is the latest and by some is thought the most successful,

the other two being Sophocles (*q.v.*) and Aeschylus (*q.v.*). Socrates held his tragedies in high esteem and visited the theater at every performance of a play written by him, though Aristophanes (*q.v.*) did not admire him, owing largely to a distaste for seeing practical life introduced into tragedy. Having difficulties in Athens for following the doctrine of a certain philosophical school and in danger of being prosecuted for impiety, Euripides left Athens for Macedon, joined the court of King Archelaus, and remained there until his death. When information of his demise reached Athens, there was mourning in the entire city. The actors on the stage of Sophocles wore mourning and the Athenians asked that his body might be buried in their city, though the Macedonian king refused this request. However, the Athenians built a tomb in his honor on the road to the Piraeus (*q.v.*) and inscribed it with "All Greece is the monument of Euripides: Macedonian earth covers but his bones." A splendid monument was erected to him by Archelaus in Pella bearing the inscription, "Never, O Euripides, will thy memory be forgotten."

Euripides articulated the contents of the Greek myth as Aeschylus and Sophocles had done before him. He was, however, much less bound by tradition than his predecessors, being irritated by dogma and definitely an individualist. Thus, his skepticism led him to reduce the ancient tales, so permeated with religious significance, to a purely human level—the first such unconventional

treatment in the history of the Greek drama.

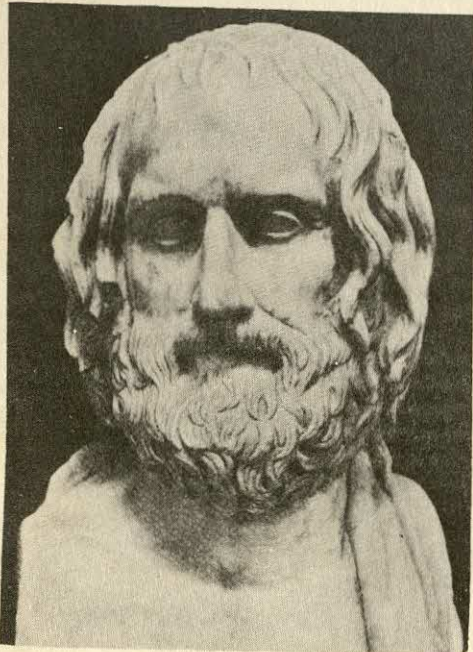
Europa (*û-rô'pà*), in mythology, a daughter of Agenor, King of Phoenicia, and the sister of Cadmus and Phoenix. It is related that she gained the love of Jupiter, who assumed the form of a bull and carried her to the shores of Crete, where he took on a human form and married her. She became the mother of Minos, Sarpedon, and Rhadamanthus.

Europe (*û'rûp*), a continent lying north of Africa and west of Asia, and with the latter forming Eurasia. From the standpoint both of history and politics it is the most important of the continents. It is the most densely populated, but is smaller than any of the others, except Australia. The northern boundary is formed by the Arctic Ocean; eastern by the Ural Mts., the Ural River, and the Caspian Sea; southern by the Black Sea and the Mediterranean; and the western by the Atlantic Ocean. The extreme northern point is Cape North; eastern, a point in Russia lying about 65° E. of Greenwich; southern, Punta da Tarifa in the Strait of Gibraltar; and western, Cape Finisterre, in the Iberian Peninsula. Its greatest length from north to south, between Cape Matapan and Cape North, is 2,400 m., and the greatest distance from east to west is 3,400 m.; that is, measured from Cape St. Vincent on the west to Sverdlovsk on the east. The total area is 3,782,000 sq. m.

The coast line is characterized by a large number of indentations, hence it has a more irregular and extended coast in proportion to its size than any of the other continents. Including the more important indentations, the coast line is about 25,000 m., but it is nearly double that length if all the indentations are followed. Many islands lie off its southern and western coasts. The western islands, which are the more important, include Ireland, Iceland, the British Isles, and the Faroe Islands. South of Europe are Corsica, Sicily, Sardinia, Crete, Malta, the Ionian Islands, and the Balearic Islands. Numerous seas and inland waters abound near all of its coast line. These include Cheskaya Bay, the White Sea, the North Sea, and the Baltic Sea on the north; the Caspian Sea, the Black Sea, the Adriatic Sea, the Aegean Sea, and the Mediterranean on the south; while the expansive Bay of Biscay is on the west. The Mediterranean and other seas have arms extending far inland, such as the Sea of Azov, the Gulf of Genoa, the Gulf of Finland, and the Gulf of Bothnia. No lakes occur in the eastern part of Europe, and those of considerable extent are in the northern portion. These include Onega and Ladoga, in Russia, and Vener, Vetter, and Mälär, in Sweden.

SURFACE. The surface of Europe is characterized by a great plain extending from the Black Sea to the White Sea, and occupying the interior from the mountains in the south and west to the

EURIPIDES



EUROPE

Asiatic boundary on the east. Its mountains form several complicated groups belonging to different geological ages, and occupy largely the southern and western portions. The most prominent system extends in a curved line from the Strait of Gibraltar along the Mediterranean to Asia Minor, and continues as the Caucasus Mts. between the Black Sea and the Caspian. This system is highest in the center, where the Alps attain a general elevation of about 12,000 ft., though Mont Blanc is 15,787 ft. above sea level and is the highest peak of the Alps. However, Jungfrau, Matterhorn, and Monte Rosa are but little inferior in height. Communication between the north and the south through these mountains is made possible by a number of famous railway tunnels, which include the Simplon, Mt. Cenis, and St. Gothard tunnels.

Several ranges extend from the central group, among them the Cévennes and adjoining ranges in France and the Cantabrian and Pyrenees in Spain, the latter containing peaks over 11,000 ft. high. The system extends eastward in two curves to the Black Sea by the Transylvanian and Carpathian Mts., which trend north of the Balkans and Dinaric Alps. North of the Alps are the ranges lying between the valleys of the Upper Danube and the Oder, and the different chains extending through what was formerly Austria-Hungary. The mountains in the Scandinavian peninsula extend from the southern point of Norway to the Arctic Ocean, a distance of about 900 m., the highest summit being about 8,000 ft. These ranges include the Kjölen and several broad plateaus that descend abruptly into numerous deep-cut valleys called *fjords*, and which are penetrated by the sea almost to the heart of the plateaus. The Ural Mts. extend along the boundary between Europe and Asia, in the north, and some distance to the west of the boundary in the center. Between the Black Sea and Caspian Sea are the Caucasus Mts., with Mt. Elburz (18,570 ft.), the highest peak in Europe.

RIVERS. Most of the rivers flow in a southeasterly direction, and have their sources either in the great central plain or in the mountains of the central west. The four largest rivers rising in the Alps are the Danube, Rhine, Po, and Rhone. Of these the Po flows into the Adriatic; the Danube, into the Black Sea; the Rhine, into the North Sea; and the Rhone, into the Mediterranean. These four rivers have large deltas. The central plain is drained toward the northwest by the Dwina and Petchora into the Arctic; by the Oder, Vistula, Dvina, and Nieman into the Baltic; and by the Rhine, Weser, and Elbe into the North Sea. Toward the south and east it is drained by the Dnieper, Don, and Dniester into the Black Sea and the Sea of Azov, and by the Ural and Volga into the inland basin of the Caspian. Numerous rivers are found in all the peninsulas, the most



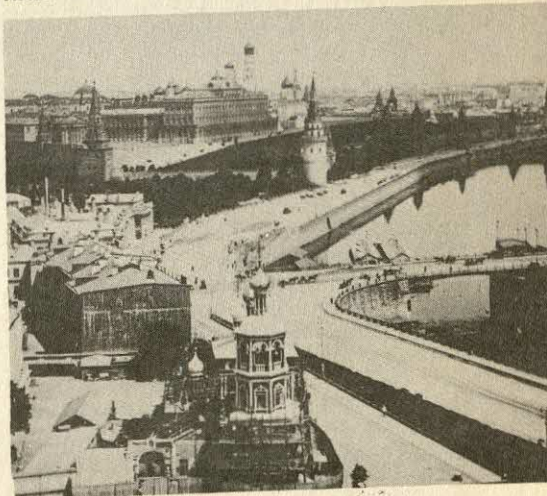
Courtesy British Information Services, N. Y.

ENGLAND. HOUSES OF PARLIAMENT, LONDON



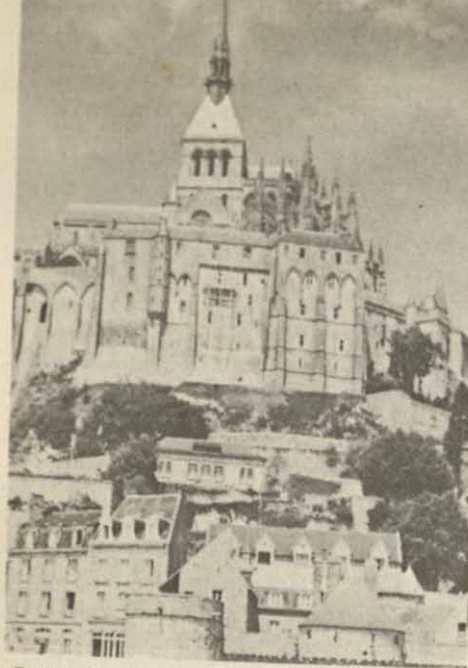
Courtesy Ewing Galloway, N. Y.

ITALY. VIEW OF NAPLES AND MOUNT VESUVIUS



Courtesy Ewing Galloway, N. Y.

U.S.S.R. THE KREMLIN AND THE MOSCOW RIVER



Courtesy French Press & Information Service, N. Y.

FRANCE. MONT ST. MICHEL

important of these being the Tagus, Douro, and Guadiana in Spain and Portugal; the Po in Italy; the Loire, Seine, and Garonne in France; the Ebro and Guadalquivir in Spain; and the Glommen in the Scandinavian peninsula.

In the northern part of Europe the lakes are frozen the greater part of the year, especially Lakes Onega and Ladoga, in Russia, and Stor Lake, in Sweden; the lakes of the south, though small, are important for their fisheries and as a basis for inland commerce. The most important of these are located near the Alps. Those south of the Alps include Lakes Iseo, Como, Maggiore, Garda, and Lugano; those on the north include Lakes Thun, Geneva, Zurich, Lucerne, Neuchâtel, and Constance.

CLIMATE. The climate of Europe is peculiarly genial, though it is marked by periods of extreme cold in the north. The shores are exposed to the warm winds and warm oceanic currents from the southwest, by which the temperature is moderated and rendered favorable to the development of plant and animal life. As we proceed east the extremes of temperature become greater, the summer being hotter and the winter colder. The most favorable effects of the oceanic currents are those experienced on the British Isles and the Scandinavian peninsula; in fact, these otherwise would be almost uninhabitable. Northern Russia and the extreme north of the Scandinavian peninsula lie partly within the Arctic Zone, and correspond in temperature to the extreme northern parts of North America.

As a whole, the climate of Europe is less severe

in the western than in the eastern part, since in the interior the mean temperature is not perceptibly affected by the sea. At Sartov, in Eastern Russia, the mean temperature is 41°; at Warsaw, 45°; at Berlin, 48°; and at Greenwich, 49°. All parts of the continent have an abundance of rainfall, but in some places it does not occur at the time of the growing season. This is true of Spain, where irrigation is needed for agriculture. However, rainfall is most abundant on the western coast and decreases toward the east in proportion to the increase of distance from the Atlantic.

MINERALS. Europe is rich in the useful minerals and many of these have been worked from times immemorial. Carboniferous coal deposits are abundant between the parallels of 40° and 60° N. They are worked with a high degree of efficiency in Great Britain, Germany, France, Belgium, Austria, and Poland. Iron ore is found in the same or adjoining fields. The output of iron is especially important in Spain, Germany, and Great Britain. Sweden has large deposits of superior steel-making ores, hence the products of this country are shipped very extensively. Nearly all of the world's supply of platinum is obtained from Russia, while sulphur comes in large quantities from Sicily and Italy. In the production of gold in the world, Russia takes fourth rank, and Spain and Portugal are exceeded only by the U.S. in the production of copper. Fine grades of marble are obtained in Italy, and granite, limestone, and other building materials are abundant in widely separated regions. Other mineral products include petroleum, tin, quicksilver, and lead.

VEGETATION. The great range of temperature makes Europe suitable for many species of plants. In the north, which extends beyond the Arctic Circle, the continent assumes the aspect of the tundra, where vegetation is very scant or entirely absent. Here thrive the saxifrage, crowfoot, poppy, scurvy-grass, and other forms common to the Arctic region. Forests of considerable value extend almost to Cape North, where the birch predominates, and farther south are fine forests of fir. The northern part of Russia and the Scandinavian peninsula do not yield cereals, but barley can be grown as far north as 70° N. latitude and wheat thrives at about 60°. As we proceed south from this locality, we come in contact with forests of oak and beech and enter sections where all classes of cereals thrive.

Rye is grown extensively in many parts of Europe, while maize, oats, and barley yield abundantly. Rice is cultivated in some parts of Spain and Italy. Much attention is given to the culture of the mulberry in the vicinity of the Mediterranean. Many varieties of fruits thrive in the southern portion, such as lemons, oranges, olives, almonds, and peaches, while the hardier varieties are cultivated extensively far into the north. The

steppes of Russia are very similar to the great prairies of North America and extend as treeless plains to the Ural Mts. They are especially rich in grasses and have been converted into a productive field for agriculture.

ANIMALS. Formerly the continent was peculiarly rich in wild animal life, but it is now quite rare, except in the northern part and in regions under government protection. Polar bears and reindeer are numerous in the north, while wolves, foxes, bears, and lynxes infest the forests and mountains. Other species more or less widely distributed include the roebuck, ibex, porcupine, stag, and fallow deer. The fisheries are valuable, especially those bearing the cod, anchovy, salmon, mackerel, herring, and tunny. Much interest is vested in the rearing of domestic animals, hence the grades are superior from careful breeding. They are very similar in all sections of Europe, except in the extreme north, where dogs and reindeer are used as animals of draft.

INHABITANTS. Racial origins of modern European people are composed of moderately diverse elements, probably attaining some of their present characteristics during the marked changes of climate and opportunity accompanying the retreat of the glaciers at the close of the great Ice Age of Europe, and developing them further with changes of location and opportunity in subsequent times. In the present inhabitants of Europe we may distinguish three main racial groups: Mediterranean, Nordic, and Alpine, with many sub-racial types which are obviously the result of a mixture of Alpines with Nordics or Mediterranean elements, being blended in different proportions in several sub-types.

Race. The principal characteristics of the Nordic group are to be found today in Norway and Sweden; also, Great Britain, Northern France, the Netherlands, Northern Germany and the republics of Finland, Latvia, and Estonia. Those characteristics are golden or ash blond hair, dolichocephalic or mesocephalic skull, tall stature, and narrow nose.

The main characteristics of the Mediterranean group are dolichocephalic skull, black or dark brown hair, narrow nose, and short stature. Those racial types are well represented in Spain, Portugal, Southern France, Italy, England, and Ireland. The home of the Mediterranean race or its place of origin cannot be fixed on the basis of present knowledge. Its center of distribution in prehistoric times seems to have been North Africa and the Near East. The provinces of Nordic concentration and Mediterranean characteristics are widely separated by the mountain zone in Central Europe, but in the west they grade into one another, and here the old long-headed type has become neither purely Nordic nor purely Mediterranean.

Racial characteristics of the Alpine type—brachycephalic skull, heavy build, short or medium stature, and dark pigmentation—are concentrated in Eastern Europe, the Balkans, and sporadically in Western Europe. The Czechs, many Bavarians and southern Slavs, as well as a large body of Russians, are Alpine in their physical makeup.

Language. Languages of the European peoples are to a large extent grouped into Celtic, Romance, Teutonic, and Slavonic families, all of which have sufficiently similar features to be classed together with Sanskrit as Indo-European. Asiatic immigrants into Europe, both in Arctic regions and on the steppes of South Russia, have brought in Asiatic languages which have persisted as far west as Lapland, Finland, Estonia, and Hungary. The present day Germanic languages are Icelandic, Danish, Dano-Norwegian, Norwegian Landsmall, and Swedish. All the languages resemble each other closely, and accordingly constitute the Germanic family of languages; they are divergent modern forms of a single prehistoric language which is sometimes called primitive Germanic. Northeast of the Germanic languages lies the Baltic family. The two surviving languages of this family are Lithuanian and Lettish. The third language of this group, Old Prussian, ceased being spoken in the 17th century. South of the Baltic and southeast of the Germanic languages is the great Slavic family, which is composed of three main groups: eastern, western, and southern. The eastern group includes White Russians, Great Russians, and Ukrainians. The western group includes the Poles, Czechs, Slovaks, and Wends. The southern consists of Bulgarians, Serbo-Croatians, and Slovenes.

To the west of the Germanic languages we find today the remnants of the Celtic family, which consists of Irish, Scotch, Gaelic, Welsh, and Breton. The latter, spoken on the northwestern coast of France, was brought there from Britain, perhaps as early as the 4th century. Celtic was in earlier times spoken over a large part of Europe, including what is now Bohemia, Austria, Southern Germany, Northern Italy, and France. It was superseded in these regions by Latin, as a result of Roman conquests, and by German languages as a result of great migrations in the early centuries of our era.

South of the Germanic languages, the Romanic family of tongues is spoken in Portugal, Spain, France, Italy, and Switzerland. To the east, on the Black Sea, cut off from the western areas by the intrusion of south Slavic, lies the Rumanian area. All the Romanic languages are modern forms of Latin, the ancient dialect of Rome.

Some scholars believe that Italic and Celtic are connected by special resemblances, so as to form

an Italo-Celtic sub-group within the Indo-European family.

East of the Adriatic, south of Serbo-Croatia, is the Albanese area. Although Albanese is full of words borrowed from the surrounding languages, the native nucleus of its forms shows it to be a separate branch of the Indo-European stock.

Greek has many local dialects which are almost entirely descended from the standard language which prevailed in the early Christian era.

Religion. The Christian religion prevails almost exclusively, the only exceptions being the Jewish in widely distributed but minor communities, and the Mohammedan in Turkey. In the western part of the continent various sects of the Protestant and Roman Catholic religions prevail, while the Greek Catholic is the predominating religion of Greece and Russia.

POLITICAL DIVISIONS. The countries of Europe as at present organized are governed wholly as independent states, with the exception of Germany (*q.v.*), and most of the more powerful nations have extended their political influence by the acquisition and control of territory in other grand divisions. The political divisions of Europe include: *Republics*, Albania; Andorra; Austria; Bulgaria; Czechoslovakia; Estonia; Finland; France; Germany; Hungary; Ireland; Italy; Latvia; Lithuania; Poland; Portugal; Rumania; San Marino; Soviet Union; Spain; Switzerland; Turkey (in Europe); Yugoslavia; *Monarchies*, Belgium; Denmark; Great Britain; Greece; Lichtenstein; Luxemburg; Monaco; Netherlands; Norway; Sweden.

HISTORY. According to some writers, Europe was named from Europa, a mythical person of Greece, who was carried off by Jupiter, though other authorities attribute its origin to the Phœnician traders, who applied it to the land of sunset, from the word *Erebh*, meaning darkness.

It is quite certain that Europe was first peopled by successive waves of migration that moved westward from Asia, each pressing the weaker farther and farther westward toward the Atlantic Ocean. The dates of these great movements are unknown, though their occurrence is evidenced clearly by the present and past settlements in the European countries. Writers generally agree that authentic history dates in Greece from about 776 B.C. All the earlier periods are estimated from circumstantial evidence. The most successful epoch of Greece is assigned to about 430 B.C., and this date marks approximately the time when all colonies pressed westward. Greek education moved westward to Rome and made Rome the predominating influence for many centuries. Greece was conquered by Rome in 146 A.D., and the latter soon made itself master of Spain, Gaul, Helvetia, Illyria, Dacia, and portions of Germany and Brittany. Roman extension carried superior laws, greater industrial

activities, and social advancement to the regions conquered, and by its theory of government provided favorable conditions for the spread of Christianity. The northern nations migrated extensively shortly after the Roman Empire began to decline, and paved the way for great commercial and educational activities in the northwest. These movements were accompanied by the settlement of the Anglo-Saxons in England, the Franks in France, the Lombards and Ostrogoths in Italy, and the Visigoths in Spain, who by superior arts rendered the original inhabitants subject to their institutions or became assimilated with them.

A great Germanic empire was established under Charlemagne in 771. After the decline of the Holy Roman Empire, as the German nation came to be called, the territory was organized into the kingdoms of Germany, France, Burgundy, Italy, Lorraine, and Navarre. These movements were followed shortly by the populations of Eastern Europe establishing themselves in regions now more or less influenced by their occupation. The most prominent movements among them were directed toward establishing kingdoms in the north of Germany, Bohemia, Russia, and Poland, while the Magyars invaded Hungary and the Normans established principalities and governments in France, England, and various regions of the southeast.

The Christian Crusades, organized to rescue Jerusalem from the Mohammedans, exercised a wide influence on the habits and learning of the western peoples, while the Turkish conquest of Constantinople, in 1453, distributed the Greek teachers and philosophers throughout Western Europe. This caused a great impetus in the revival of learning, led to the invention of printing, and ultimately resulted in the Reformation. Spain became the most powerful nation shortly after the discovery of America. France soon after rose to a high plane of influence and the territories of Prussia and Russia were greatly enlarged and the sphere of their power was widened. Overpopulation of most countries was the indirect cause of several extended wars. These conflicts were followed by the French Revolution (*q.v.*), the dissolution of the German Empire, and the colonial development of several nations.

Among the more recent events in European history may be enumerated the independence of Greece; the absorption of Poland by several states; the unification of Italy; the consolidation of Germany into an empire; the establishment of the French Republic, as a result of the Franco-Prussian War; the curtailment of Turkish influence by the independence of Bulgaria, Rumania, Serbia, and Montenegro; and the War of 1897 between Greece and Turkey. The dissolution of the union between Sweden and Norway (1905) restored the independence of Norway. As a result of the Bal-

kan War, in 1912-13, Turkey lost much territory, Greece and the Balkan states were enlarged, and Albania became a kingdom.

In 1914 Europe was thrown into the greatest war of history (up to that time), which lasted more than four years. Among the changes resulting from this war were the independence of Finland, Poland, and the Baltic states; the establishment of Czechoslovakia and Yugoslavia; the enlargement of France, Italy, Rumania, and Greece; the dismemberment of Austria-Hungary and Turkey in Europe; the weakening of Bulgaria and Germany; the establishment of a Soviet Republic in Russia; and the recognition of Japan and the U.S. as world powers. In 1919, the Versailles treaty (*q.v.*) attempted to settle the problem of a lasting peace. The period 1919-29 was marked by the emergence of a League of Nations (*q.v.*) and the gradual settlement of certain international problems. Greece, Italy, and Poland pursued nationalist policies of expansion against their neighbors. The Geneva Protocol for the Pacific Settlement of International Disputes took shape in 1924, and was followed by the Young Plan (1929), an attempt to settle German reparations. The Locarno treaty (1925) guaranteed existing boundaries in Western Europe. The Kellogg-Briand Pact (1928) theoretically outlawed war. The League of Nations during this period averted several international conflicts; its committees collected valuable data on law, labor, sanitation, the drug traffic, and economic questions. Many vital problems arose in various countries, England was concerned with Irish and Indian requests for independence, and economic questions at home.

The economic depression that began late in 1929 lasted over 10 years and had different repercussions in various countries. The erection of high tariff walls, begun by the U.S. in 1930 (Hawley-Smoot Tariff Bill), caused serious interruption in international trade. The financial chaos in Germany and Austria was manifested in their attempt to form an economic unit in 1931, which was prevented by the World Court. The fall of the mark and other European currencies, and panic among German and other Southeastern European banks, emphasized the economic disorder, rendered more difficult by the millions of unemployed in the various countries. The U.S., having become the leading economic power in the world, attempted economic readjustment by declaring a one-year moratorium on all inter-governmental debts (including reparations), June 20, 1931. By an international conference at Lausanne, June 1932, Germany was almost entirely freed from reparation payments. A World Monetary and Economic Conference was held in London, June 1933. Meanwhile, Soviet Russia was completing her first Five Year Plan, a planned, centrally controlled economy.

With Hitler's rise to power in Germany, on Jan. 30, 1933, French military domination declined and authoritarian rule (begun in Italy under Fascist Benito Mussolini, 1922), started to flourish. The countries dissatisfied with the treaties which ended World War I (Bulgaria, Germany, Hungary, Italy, and Japan, principally) combined (first loosely, later by joint actions) to jeopardize concerted attempts of all nations to preserve peace and improve social welfare. The League's influence faded under the aggregation of hostile acts. In 1935-36, Italy invaded and annexed Ethiopia; Japan attacked China, 1931, 1932, and 1937. Spain, after legally electing a liberal-socialist government in 1936, was involved in a civil war (1936-39) when Spanish army units under Gen. Franco, actively aided by Germany and Italy, revolted. While the great democracies, England and France (the latter going through a period of social unrest), followed a policy of inconsistency and appeasement, the Spanish Civil War proved the testing ground for Germany's *Blitzkrieg* which broke out against Poland, Sept. 1, 1939, when Germany had accomplished the domination of Southeastern Europe by the annexation of Austria and the dismemberment of Czechoslovakia (see Munich Pact) in 1938 and 1939. World War II, which affected in greater or lesser degree all of the civilized world, was undoubtedly the greatest disaster which ever struck Europe. Among the major results were: (1) the subjugation of Fascism and Nazism, the decline of Germany and Italy to minor powers, and the temporary division of Germany into zones of occupation; (2) the penetration of the U.S.S.R. into large parts of Europe which, in turn, led Russia into controversies with the Western World; (3) the depletion, in human and material terms, of the resources of the continent.

Western Europe, sparked by Communist threats, has taken various steps toward close cooperation. Aimed ultimately at political unification, the Council of Europe was formed in 1949. France, Western Germany, Italy, and the Benelux countries established (1952) the European Coal and Steel Community, the first international organization with supranational powers, although limited to its specialized economic field and in 1957 ratified treaties concerning a common market and utilization of the atom. These powers and Britain also signed (1954) a series of treaties expanding the provisions of the Brussels Treaty (*q.v.*) for the defense of Western Europe, under the commander of the North Atlantic Treaty (*q.v.*) forces. See also *World War I*; *World War II*; and articles on individual countries.

European Movements for Unity, a series of international moves dating from the end of World War II and tending toward a degree of economic and—perhaps ultimately—political inte-

gration of the countries of Europe. The first notable advocate of European unity was Winston Churchill (*q.v.*), who as early as 1943 proposed the formation of a council of Europe. In 1948 at a congress of national unity groups at The Hague, the groundwork for an international organization was laid, and in 1949 the Council of Europe was established. The council is parliamentary in structure, consisting of a committee of ministers and a consultative assembly. Although its decisions are not binding on member nations, it may consider all questions except those relating to national defense. The founding nations were Belgium, Denmark, France, Great Britain, Ireland, Italy, Luxembourg, The Netherlands, Norway, and Sweden; Austria, Greece, Iceland, Turkey, and West Germany later became full members.

In 1952 a significant move toward unity was taken with establishment of the European Coal and Steel Community (E.C.S.C.) to provide a single market and international control for coal, iron ore, and steel. The founding nations, known as the Six (or Inner Six), were Belgium, France, West Germany, Italy, Luxembourg, and The Netherlands.

The notable success of the E.C.S.C. led in 1957 to establishment, by the treaty of Rome, of the European Atomic Energy Community (Euratom) and the European Economic Community (E.E.C., or the Common Market). Both shared with the E.C.S.C. the same court of justice and the same parliamentary assembly, whose membership was doubled. The treaty establishing Euratom provided for the removal of all restrictions on the free movement of fissionable material and nuclear technicians, and the setting up of a commission to own and control fissionable material.

The Common Market treaty provided for the gradual reduction and abolition of quota restrictions and customs duties on trade between member countries and the adoption of a common external tariff during a transitional period of 12 to 15 years. Although national interests frequently interrupted the smooth transition to a supranational economy, significant progress was made, and other nations applied for full or associate membership. See also *World Government*.

European Recovery Program, abbreviated E.R.P., a plan for the economic rehabilitation of post-World War II Europe, also known as the Marshall Plan. It provided for a combination of joint industrial planning by war-damaged countries and an extension of U.S. aid to support their recovery efforts. The Economic Cooperation Act of 1948 provided for a program, supported by annual Congressional appropriations, which was to run from April 1948 through June 1952. Of the \$13,000,000,000 appropriated for European recovery by June 30, 1951, \$11,659,900,000 had been allotted for nonmilitary purposes when the

Economic Cooperation Administration (E.C.A.), set up by the act to administer the program, merged with the Mutual Security Agency in September 1951.

Paul Hoffman (*q.v.*) served as first administrator of the E.C.A. (1948-50). The act also created a special Public Advisory Board consisting of the administrator as chairman and 12 other U.S. citizens appointed by the President. The E.C.A. was empowered to extend aid to any country wishing to cooperate in the program. The United Kingdom, France, Italy, The Netherlands, Western Germany, Austria, Belgium, Luxembourg, Greece, Denmark, Ireland (Eire), Norway, Sweden, Iceland, Turkey, Portugal, and Trieste joined the program. Aid to the United Kingdom and Ireland was discontinued early in 1951 because of their economic recovery.

The European participants established the Organization for European Economic Cooperation (O.E.E.C.) to deal with the E.C.A. and to integrate recovery programs into a general pattern for the development of Western Europe. The European Payments Union, created in 1950, established a multilateral trading system. Later the O.E.E.C. was reorganized as the Organization for Economic Cooperation and Development (O.E.C.D.) among the North Atlantic nations, with the U.S. and Canada becoming active members.

The E.R.P., set up to prevent economic and political chaos among the war-shattered countries of Europe, had been vigorously opposed by the U.S.S.R. from the time when Secretary of State George C. Marshall (*q.v.*) enunciated it in June 1947. The program, which accelerated the economic recovery of the participating nations, gave impetus to trade expansion and economic agreements among the cooperating countries, stimulated political cooperation aimed at ultimately forming a political union of Western European states, and obstructed serious Communist inroads into Western Europe. The U.S.S.R., preventing its Eastern European satellites from accepting American aid, in turn inaugurated (1949) a Council for Economic Mutual Assistance designed to promote exchange of economic aid and information among the satellite nations.

Eurydice (*ū-rīd'ī-sē*), in mythology, the wife of Orpheus (*q.v.*). She died from the bite of a snake and was followed by her husband to the lower world. He so charmed Pluto by his lyre that Pluto released Eurydice on the condition that Orpheus refrain from looking back (*i.e.*, at Eurydice) until both arrived in the upper world. Orpheus disobeyed, and Eurydice disappeared.

Eurythmics (*ū-rīTH'mīks*), Greek, meaning "harmony," a style of artistic expression which aims at uniting music, gymnastics, and dance. Music and gymnastics were considered a means of body training by Plato. Various modern

systems have adopted the idea in their educational theories. Émile Jaques-Dalcroze (*q.v.*), in particular, founded the Dalcroze method of physical rhythmical education.

Eusebius (*û-sê'bi-ûs*), called EUSEBIUS PAMPHILI, one of the most important of the Fathers of the Church (*q.v.*), born in Palestine, *ca.* 264; died there, *ca.* 340. A pupil of Pamphilus of Caesarea, Eusebius became bishop of Caesarea *ca.* 315 and played a leading role at the Council of Nicaea in 325. He is considered the most capable of early Christianity's ecclesiastical historians and is referred to as the "Father of Church History." The basis for this reputation is his



The Bettmann Archive, N.Y.

EUSEBIUS

"*Historia Ecclesiastica*" (10 vols. on the history of the Church from the time of Christ until shortly after 300). Another of his scholarly works is "*Praeparatio Evangelica*" (15 vols.), an extensive introduction to Christianity containing many excerpts from Greek classical literature.

Eustachio (*â-ôô-stâ'kyô*), BARTOLOMEO, anatomist, born in San Severino, Italy, in the early part of the 16th century; died in Rome in 1574. He became a professor of anatomy in Rome and did much to advance knowledge in that field. He described the Eustachian tube (*q.v.*) of the ear and the Eustachian valve of the heart, which were named after him, as well as the uterus, the thoracic duct, the stapes, and the teeth. A book containing his anatomical drawings, "*Tabulae anatomicae*," was published in 1714.

Eustachian Tube (*û-stâ'ki-gn*), in anatomy,

the canal extending from the pharynx to the middle ear. Its function is to equalize the pressure of the air on either side of the tympanic membrane. Throat infections may spread to the middle ear through this channel and impair hearing.

Eustis (*û'stîs*), JAMES BIDDLE, soldier and statesman, born in New Orleans, La., Aug. 27, 1834; died in Newport, R.I., Sept. 9, 1899. He received a classical education and was graduated from Harvard Law School in 1854. He subsequently practiced law in New Orleans, but at the outbreak of the Civil War (1861) he entered the Confederate service as judge advocate of the staff of Gen. John Magruder. He was transferred to the staff of Gen. Joseph Johnston in 1862, with whom he remained until the war closed. Soon after he resumed the practice of law, Eustis was elected (1872) to the lower house of the Louisiana legislature and then served (1874-78) in the state senate. He was elected to the U.S. Senate as a Democrat in 1876 to fill an unexpired term, and, at its completion (1879), he accepted the chair of civil law in the Univ. of Louisiana. He was again elected to the Senate in 1885, where he served until 1891. In 1893 President Cleveland appointed him minister to France, a post he filled until 1897. After he returned to the U.S., he practiced law in New York City.

Eutaw Springs (*û'ta*), BATTLE OF, an engagement of the American Revolution, fought about 60 m. N.W. of Charleston, S.C., on Sept. 8, 1781. General Nathanael Greene (*q.v.*) commanded the 2300 Americans, Gen. Alexander Stewart the British forces. The former attacked at dawn and were apparently victorious, but the British rallied. That night the British retreated to Charleston, where they were effectively confined for the rest of the war. Eutaw Springs thus proved a strategic victory for the Americans, although they suffered a tactical defeat in the battle. The Americans lost 535 men in the fighting, the British about 630.

Euterpe (*û-têr'pê*), in mythology, one of the nine Muses, the inspirer of delight. She presided over lyric poetry and played on the double flute, of which she was the inventor. In sculpture she is usually represented as a virgin crowned with flowers, holding a flute or with musical instruments around her.

Evangelical United Brethren Church (*ê-vân-jêl'i-kal û-nî-têd brêTH'r'n chêrch*), the name of the Evangelical Church and the United Brethren Church, two Protestant denominations, after their merger on Nov. 16, 1946. The Church of the United Brethren in Christ goes back to the 18th century, when Philip W. Otterbein (1726-1813), a German-born pastor of the Reformed Church, and Martin Boehm (1725-1812), a Mennonite minister, exerted their influence and later were chosen bishops of the church. In 1800 a general conference was held and bishops

were elected. The Evangelical Church dates back to the late 18th century, when Jacob Albright (1759-1808), a Lutheran who came under the influence of the Methodist ministry, worked as an itinerant preacher to German communities in Pennsylvania. By 1803 his followers became known as "Albright's people." In 1816, the name Evangelical Assn. was adopted; and in 1922, it was changed to Evangelical Church.

The creed of the merged church, known as the Confession and Articles of Faith, consists of 13 articles pertaining to the United Brethren Church and 19 articles pertaining to the Evangelical Church. In government, polity, and worship, the church resembles the Methodist church. The headquarters are at Dayton, Ohio, where the Otterbein Press is located, and Harrisburg, Pa., where the Evangelical Press is situated.

A membership of 761,858 was reported in 1960.

Evangelist (*ē-vān'jēl-ist*); a bringer of the Gospel (*q.v.*), a term originally applied to the writers of the four Gospels, Sts. Matthew, Mark, Luke, and John. In modern times it has come to mean a preacher with no fixed congregation, a traveling missionary who organizes church societies, or a minister or layman who attempts to revive religious interest in various places by his preaching. See also *Revival*.

Evans (*ēv'anz*), MAURICE, actor and manager, born in Dorchester, England, June 3, 1901. He made his theatrical debut at the age of seven. Following his professional debut (1926) as *Orestes* in the "Oresteia" by Aeschylus, he played a number of other parts before his portrayal of *Second Lieutenant Raleigh* in R. C. Sherrieff's "Journey's End" (1929) established him as a leading actor on the London stage. He played (1934-35) with the Old Vic Company. Evans came to

MAURICE EVANS AS HAMLET

Courtesy Moss Photo, N.Y.



the U.S., at the invitation of Katherine Cornell (*q.v.*), to play (1936) *Romeo* to her *Juliet*. He remained in the U.S. and appeared in the title role of his own Broadway production of "Richard II" in 1937. He produced and starred (1938-39) in "Hamlet" and "Henry IV" (in which he played *Falstaff*) and then appeared with Helen Hayes (*q.v.*) in "Twelfth Night" (1940-41) and with Judith Anderson in "Macbeth" (1941-42).

During World War II Evans became a U.S. citizen (1941), served in the Army, and entertained American troops with shortened "G.I. versions" of Shakespearean plays. After the war, he continued as an actor-producer and extended his activities into motion pictures and television. Among his best-known recent appearances were: (on Broadway) "Dial M for Murder" (1952-54) and "Tenderloin" (1961); (in motion pictures) "Androcles and the Lion" (1951) and "Gilbert and Sullivan" (1952); and (on television) "Hamlet" (1953), "The Devil's Disciple" (1955), and "Man and Superman" (1956).

Evans, OLIVER, inventor, born in Newport, Del., in 1755; died in New York, N.Y., April 15, 1819. He invented the high-pressure steam engine and the automatic flour mill and experimented with steam road carriages. He wrote "The Young Mill-Wright and Miller's Guide" (1795) and other books.

Evans, ROBLEY DUNGLISON, U.S. naval officer, born in Floyd County, Virginia, Aug. 18, 1846; died in Washington, D.C., Jan. 3, 1912. He served in the Union navy as an ensign during the Civil War. In 1891 Evans commanded the gunboat *Yorktown* on a mission to Chile. He was in charge of the battleship *Iowa* at the time of the Spanish-American War, and his ship fired the first shot in the battle of Santiago, July 3, 1898. He was made a rear admiral in 1901 and retired from the service in 1908. He published "A Sailor's Log" (1901) and "An Admiral's Log" (1910), both containing accounts of his naval career.

Evanston (*ēv'anz-tūn*), a city in Cook County, Illinois, part of the metropolitan area of Chicago, ca. 12 m. from the Chicago Loop. It is served by the Chicago and North Western and other railroads. Situated on Lake Michigan, Evanston is primarily a residential suburb but also serves as a shopping center for the entire North Shore and contains much industry. The manufactures include air-conditioning machinery, hospital supplies, toys, steel, radio and television appliances, and optical instruments. In 1958 the city had a value added by manufacture of \$52,474,000. Northwestern Univ., Seabury-Western Theological Sem., National Coll. of Education, and Garrett Biblical Inst. are located here. First platted in 1853-54, it was incorporated as a city in 1892. Population, 1960, 79,283.

Evanston, a city in Wyoming, seat of Uinta

County, in the southwestern part of the state. It is located on the Bear River and the Union Pacific R.R. and is surrounded by an agricultural and dairying district. The manufactures include flour and machinery. Coal, iron, and petroleum deposits are found in the vicinity. Evanston was settled in 1869 and incorporated in 1888.

Population, 1940, 3,605; in 1950, 3,863; in 1960, 4,901.

Evansville (*ev'anz-vil*), a city in Indiana, seat of Vanderburgh County, on the Ohio River, 150 m. s. of Indianapolis, Ind. Evansville covers an area of 19.63 sq. m. and is served by the Louisville and Nashville, Illinois Central, New York Central, and other railroads. Dress Memorial Airport is 5 m. N.E. of the city.

Evansville has 24 parks, with a total of over 1,000 acres. Mester Park (100 acres) houses a municipal zoo. The Roberts Municipal Stadium (seating capacity, 11,232) provides an arena for all sports and large stage events. The art museum holds classes and sponsors visiting exhibits.

The chief products of Evansville are automobiles, infant food, bottle caps, flour, furniture, refrigerators, awnings, beer, and air-conditioning equipment. The Union Stockyards comprise the largest covered stockyard in the U.S. Evansville is the center of a standard metropolitan statistical area (681 sq. m.; pop., 1960, 199,313) which includes all of Vanderburgh County, as well as Henderson County, Ky., and which had a value added by manufacture in 1958 of \$273,311,000.

The public school system enrolls ca. 27,000 students annually; the parochial schools, ca. 7,000. Evansville Coll. is located here.

Evansville was settled in 1812 by Hugh McGary, who pitched his camp on the present site of the city after returning from fighting engagements with Indians. The town was later mapped out (1817) by McGary and Col. Robert M. Evans, after whom Evansville was named. The city received its charter in 1847 and established a mayor-council form of government.

The population of Evansville was 3,235 in 1850, 59,007 in 1900, 128,636 in 1950, and 141,543 in 1960.

Evaporation (*é-văp-ô-ră-shūn*), the conversion of a liquid by heat into a gaseous state. If the substance is a liquid at normal temperature, its gaseous state is called a vapor. Water vapor, for example, is the term applied to gaseous water. Some solids "evaporate" into a gas without passing through the liquid state. These, such as mercuric chloride, iodine, and camphor, are said to go through the process of sublimation rather than evaporation.

The molecules of any material are continuously in motion, except when the temperature is at -273.16°C ., or "absolute zero," where all molecular motion theoretically ceases. All mole-



Courtesy Chamber of Commerce, Evansville, Ind.
AIR VIEW OF EVANSVILLE, INDIANA

cules at the same temperature have the same average kinetic energy, $\frac{1}{2}mv^2$, where m is the mass of one molecule, and v^2 is the square of its velocity. Evaporation of liquids occurs when the molecules achieve such speed that some of them break away from the molecular attraction they have for each other and escape into the air. When heat, which is a form of energy, is applied to liquids, the speed of the molecules of the liquids is increased, and, as the temperature is raised, more and more of them break away from the liquid into the surrounding space. Thus evaporation occurs at all temperatures above absolute zero, but most rapidly at high temperatures. As the molecules of vapor rise, they collide with air molecules which push some of them back into the liquid. This continues until a point is reached where the speed of the vapor molecules enables them to push the air molecules before them, and the vapor escapes as fast as it is formed. At this point, increased heat will no longer raise the temperature of the liquid, but it will hasten the rate of evaporation. This is called the boiling point of the liquid, or the point at which the vapor pressure overcomes the air pressure. The saturation point of vapor in air is reached when

escaping vapor molecules are returning to the liquid at the same rate at which they are evaporating from the liquid. The saturation pressure depends upon temperature alone. The higher the temperature the more vapor molecules occupy the air above the liquid. When the temperature is reduced, fewer molecules escape from the liquid, and the excess vapor molecules above the liquid condense, until the vapor above the liquid is again at the point where vapor molecules are returning to the liquid at the rate at which molecules are escaping.

In nature, evaporation takes place from the oceans, from rivers, lakes, soil, and the leaves of vegetation as well as from the bodies of animals. The term "relative humidity" is used to designate the amount of water vapor in the atmosphere. When it is saturated, the relative humidity is 100 per cent. Should the air be cooled, less moisture is required to maintain the saturation point, and the excess vapor condenses as fog or clouds, and when sufficient condensation takes place rain or snow falls.

The amount of heat applied to change a liquid into a vapor is equal to the amount of heat given off when the vapor condenses to its liquid form again. The heat required to change one gram of a liquid at its boiling point to vapor is called the "heat of vaporization." When this gram of vapor is condensed again it gives off an equal amount of heat, called the "heat of condensation." For water, the heat of vaporization and the heat of condensation are each 537 calories. This principle of the equality of the heats of vaporization and condensation is utilized in refrigeration systems, where the refrigerating material, such as Freon, is forced under pressure into a chamber which permits it to expand into vapor. The evaporating liquid absorbs an amount of heat equal to its heat of vaporization, and thus cools its surroundings by the absorption of heat. The cycle is completed by a pump which recondenses the vapor to a liquid at its heat of condensation. This heat is carried off, and the liquid returned under pressure to the beginning or cooling phase of the cycle.

Evarts (*ēv'erts*), WILLIAM MAXWELL, lawyer and statesman, born in Boston, Mass., Feb. 6, 1818; died Feb. 28, 1901. He was graduated from Yale, where, with several others, he founded the *Yale Literary Magazine*. Later he studied at the Harvard Law School and was admitted to the bar of New York in 1840. In 1860 he was chairman of the New York delegation in the Republican national convention, served as Attorney General of the U.S. in 1868-69, and was counsel in the impeachment trial of President Johnson. He was counsel for the U.S. before the tribunal of arbitration on the *Alabama* claims at Geneva, Switzerland, in 1872. In the famous trial of Henry

Ward Beecher, which took place in 1874, he was senior counsel, and served as counsel before the electoral commission in behalf of President Hayes. From 1877 to 1881 he served as Secretary of State, and was elected senator from New York for the term of 1885-91, after which David B. Hill succeeded him. Evarts, who ranked among the most eminent lawyers of America, was honored by several educational institutions, and published a number of addresses, among them the centennial oration at Philadelphia, a eulogy on Chief Justice Chase, and addresses delivered at the unveiling of the statues of Seward and Webster and the Bartholdi Statue of Liberty.

Eve (*ēv*). See *Adam and Eve*.

Eveleth (*ēv'e-lēth*), a city in St. Louis County, Minnesota, 70 m. N.W. of Duluth, on the Duluth, Missabe & Iron Range R.R. A business and commercial center, Eveleth is important because of the enterprises connected with the iron industry of the nearby Mesabi Range. Founded in 1892, it was incorporated the next year. Population, 1950, 5,872.

Evening Primrose (*ēv'ning prīm'roz*), a plant, native to Virginia, having fragrant flowers and a root which looks like a short carrot. It is red, tender and fleshy, and is edible.

Evening Schools (*seōl'z*), special schools which meet in the evening to provide instruction for persons who for any reason cannot attend school during the day or who desire additional specialized training. Evening schools are established in many countries throughout the world, chiefly in large cities, and may offer instruction on any academic level, in any art, trade, or profession. In some countries they are supported by the government and operate as a part of the public school system for the benefit of children or adults employed during the day.

The establishment of evening schools in the U.S. dates from the middle of the 19th century, when they were attached to the public education systems of several large cities. Their main purpose is to provide elementary, secondary, or commercial instruction, and they have also performed a great service of teaching English to foreigners. The Drexel Inst. of Philadelphia and Cooper Union of New York City were among the first outstanding institutions to offer both general and special instruction. Experience has shown that evening schools are an essential public service in large communities. At present, most city trade, commercial, art, and music schools, as well as lower schools and universities, public or private, offer evening courses.

Evening Star, any planet located in the western sky shortly after sunset, especially Venus in that configuration.

Even Number (*ē'ven nūm'bēr*), a term in mathematics. See *Number*.

EVEREST

Everest (*ēv'ēr-ĕst*), MOUNT, the highest mountain peak in the world, situated among the great peaks of the Himalaya, on the border between Nepal and Tibet, in Asia. Rising 29,028 ft. above sea level, it was named for the English engineer, Sir George Everest (1790-1866), who surveyed it in 1841. Between 1921 and 1952, 11 attempts were made to scale Everest's lofty summit. Finally, on May 29, 1953, Edmond Hillary, a New Zealander, and his Sherpa guide, Tensing Norkay, reached the top. Both men were members of a British expedition led by Col. H. C. J. Hunt (Hunt and Hillary were knighted for this achievement by Queen Elizabeth II in 1953).

Everett (*ēv'ēr-ĕt*), a city in Middlesex County, Mass., 3 m. N. of Boston. Primarily an industrial city, it manufactures steel products, chemicals, paints and varnishes and has coal and petroleum storage plants. It was set off from Malden in 1870 and incorporated in 1892. Population, 1950, 45,982.

Everett, city seat of Snohomish County, Wash., 28 m. N. of Seattle. Located on Puget Sound at the mouth of the Snohomish River, it is served by the Great Northern and the Northern Pacific R.R.'s. It was developed as a seaport and industrial center for lumber and pulpwood. The city also has fisheries and canneries and is a distributing point for agricultural and dairy products. Founded in 1890, Everett was incorporated in 1893. Population, 1950, 33,849.

Everett, EDWARD, statesman and author, born in Dorchester, Mass., April 11, 1794; died in Boston, Jan. 15, 1865. Graduated from Harvard Coll. at 17, he became a Unitarian minister in Boston two years later. Offered (1815) an appointment as professor of Greek literature at Harvard, he went abroad for further study. In 1817 he received a doctorate from the Univ. of Göttingen, Germany, and took up his duties at Harvard in 1819. He also edited (1820-23) the literary periodical, the *North American Review*.

Everett's public career began in 1825 with his election to Congress. He adopted a conservative stand on the slavery issue and attempted a compromise solution to the problem, in which he was opposed by the majority of Northern legislators. He was governor of Massachusetts (1836-40), minister to England (1841-45), and president of Harvard (1846-49). Everett succeeded the late Daniel Webster as Secretary of State during the last four months (1852-53) of President Fillmore's administration, entering the Senate in 1853. Although his political career was at its height, he was forced to resign his Senate seat 15 months later because of his attitude on slavery. Everett opposed both the institution of slavery and abolition; he was convinced that forcing abolition on the South would destroy the Union. Since Massachusetts public opinion was pre-



Wide World Photos

CONQUERORS OF MOUNT EVEREST

Left to right: Hillary, Hunt, and Tensing Norkay

dominantly anti-slavery, his position was distinctly unpopular.

Everett was the Vice Presidential candidate of the Constitutional Union party in 1860, but he devoted the last years of his life to lecturing rather than to politics. He was noted throughout the U.S. as an eloquent speaker. One of his most popular addresses was his speech on George Washington, which he delivered 129 times in order to raise money for the purchase of Washington's home at Mt. Vernon. During the Civil War, his speeches for the Union cause gathered large audiences in the North. His oration at Gettysburg (Nov. 19, 1863) preceded Abraham Lincoln's address. Everett's public addresses, "Orations and Speeches on Various Occasions," appeared in four volumes, from 1853 to 1868.

Everglades (*ēv'ēr-glād-z*), a swampy region in southern Florida, lying between Lake Okechobee and the Gulf of Mexico; area, ca. 5,000 sq. m. It is characterized by water and saw-grass prairies, with a wide variety of subtropical flora and fauna, and studded with mangrove forests and sandy beaches. Subject to heavy rains, the area also receives the overflow from Lake Okechobee. Early in the 20th century, a drainage project was carried forward with the building of canals between the lake and the Atlantic Ocean. This made available rich black earth for farming and grazing land. Reclamation is confined to border areas, however, since a series of grass fires in the 1930's pointed out the danger of over-drainage. Experiments with tropical plants and with dairying are carried on at the Everglades Experiment Station, ca. 40 m. W. of Palm Beach. Everglades National Park, at the southern end of the state and embracing part of the Florida Keys was established in 1947 as a refuge for tropical wildlife; it includes Royal Palm State Park. The Seminole Indians, whose refusal to leave the region led to the Seminole War of 1835, now live on two reservations here.

The first white man to enter the Everglades (18th century) was Escalante de Fontenada, a

Spaniard whose ship became wrecked in the Strait of Florida. He was captured by natives, and, although later freed, left only meager notes.

Evergreen (*ēv'ēr-ġrēn*), the trees and shrubs which retain their verdure through all seasons, as the fir, laurel, cedar, holly, cypress, juniper, etc. Evergreens usually shed their leaves in the spring, after their successors have reached a state of development, but in some instances a set of leaves lasts several years. The leaves are generally of thicker and firmer texture than those of deciduous trees, and the undiminished thickness of the foliage, characteristic of the northern scenery both in summer and winter, affords exceptional winter shelter for animals. Evergreens form very popular ornamental shade trees, and their boughs are used on festive occasions for decorative purposes.

Evergreen State, popular name for the State of Washington, because of its evergreen forests.

Everlasting Flower (*ēv-ēr-lās'ting flou'ēr*), the popular name of various flowering plants, the bloom of which may be kept many years without a material diminution of beauty. They include the amaranth, some species of cudweed, and a number of others. See *Immortelles*.

Everyman (*ēv'rj-mān*), the most famous English morality play of the 14th century. In this medieval play, Everyman is hunted and summoned by Death; his friends desert him, and nothing but his Good Deeds remain with him. The play depicts steady juxtaposition of good and evil powers. In its modern version by the Austrian Hugo von Hofmannsthal (*q.v.*), it has lost nothing of its original impressive force. It was among the most often performed plays at the Salzburg Festivals (*q.v.*).

Evidence (*ēv'i-dēns*), in law, that which tends to prove or disprove any matter in question. It differs from the proofs by which human judgment is ordinarily determined in nonjudicial matters, chiefly in certain rules established for the sake of felicity in disposing of complicated questions of fact, or of public policy, when by lapse of time or other causes there would be a deficiency of evidence. The rules under which evidence is admitted differ more or less, though in general they have many points in common, and for convenience are reduced under four heads, as follows: (1) Cases in which evidence is excluded on the ground of being untrustworthy and tending to show by its very nature that it likely is untrue. (2) Cases in which a rule is prescribed for the purpose of getting at a certain conclusion, though arbitrarily, when the subject is intrinsically liable to doubt from the remoteness, discrepancy, or actual defect of proofs. (3) Cases in which a legal presumption is substituted for actual proof, or in place of what could be proved, being supposed to be more consistent with the real rights of the parties than any result which could be

expected from positive testimony. (4) The graduation of the weight of evidence, which will be found in some instances to be arbitrary in its origin, and, perhaps, not altogether in accordance with the ordinary process of judgment.

Evidence is usually studied under four heads: oral or documentary, direct or circumstantial, primary or secondary, and *prima facie* or conclusive. *Oral evidence* consists of statements made under oath by witnesses in court, while *documentary evidence* includes proofs in writing, which are submitted to the court or jury for inspection. *Direct evidence* is proof in itself of the existence of a fact, while *circumstantial evidence* is indirect, tending to show by circumstances that the fact sought to be established has existence. *Primary evidence* proves a fact by the best evidence obtainable, while *secondary evidence* is admissible only when primary evidence cannot be shown. For instance, when a case hinges upon a written contract, the agreement in writing must be produced if possible, but, if it is shown that it cannot be procured as evidence, then its existence may be proven by a copy or by oral testimony. *Prima facie evidence* is such as the law declares, or in fact appears, to be sufficient proof, while *conclusive evidence* establishes a fact and renders inadmissible any evidence to contradict it. While the rules governing evidence are very extensive, the essence of this branch of the law hinges upon what can be proved, rather than what is true.

Evolution (*ēv-ō-lū'shūn*), in biology and geology, the steps by which organic and inorganic matter came to exist in their present forms. Perhaps the most important feature of the 19th century was the development of the scientific method and related technologies. Although the industrial revolution based on the physical sciences was greater in its immediate impact upon society, in the long run the biological sciences are proving to be of equal importance. The beginning of this modern period in biology was marked by the publication (1859) of "Origin of Species," by Charles Darwin (*q.v.*), embodying the thesis that all existing plants and animals have evolved "from a few simple forms or one." Although the idea of evolution had occurred to many before Darwin, they had not buttressed their statements with sufficient evidence to win wide approval, especially in the face of considerable immediate hostility from those who for religious or other reasons feared the logical deduction that man himself has developed during the course of the ages from lower animals, specifically from apes.

Despite all objections, the theory of evolution was accepted by most biologists within a few years after the appearance of this epochal book. With passing years so much more evidence ac-

crued that today the idea of evolution is accepted not only by scientists but by virtually all who have impartially investigated the question. Indeed many phases of evolution such as the modifications of domestic plants and animals under artificial selection and the occurrence of inheritable (genetic) changes or mutations are matters not of theory but fact.

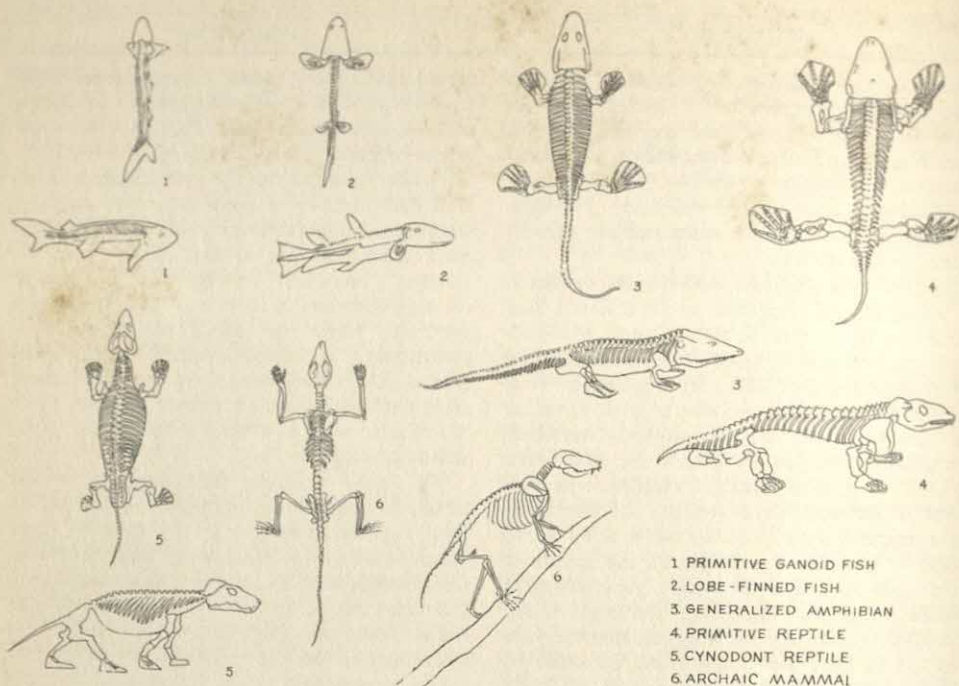
Darwin marshaled the evidence for evolution in a few general categories which it is still convenient to retain. One of the basic ones is homology: the existence of basic structural similarities in superficially very different organisms. Thus giraffes have the same number of neck vertebrae as other mammals but the individual vertebrae are greatly elongated. Birds have the same bones in their wings as mammals or reptiles do in their forearms and feet, though reduced and compacted as an adaptation for flight. Whales have the warm blood of other mammals though the species of arctic seas have had to acquire great layers of blubber to insulate them from the frigid water. Countless similar instances suggest that the various species have arisen one from the other by gradual modification (evolution). If all these species and groups had been independently and instantly created at the same time, there would seem no logical reason for many of these similarities. This is especially true for vestigial organs, those which have no function, but are easily explained when we find them in more developed form in species that seem ancestral. Thus some birds have tiny useless claws on the tips of the finger bones hidden among the feathers of the wing. These were doubtless inherited from the clawed forelimbs of their reptilian ancestors. In many other birds they have been completely lost. Such vestigial organs are more often present in the embryos or young and sometimes lost before adulthood. The embryos of man and other mammals have unmistakable gill clefts on the sides of the neck corresponding to those of some fishlike ancestor of the very distant past. Before birth these are lost and partially incorporated into the structure of the throat. Such considerations have led to the theory that the life of the individual from embryo to adult repeats the evolution of the species. This is true in a very general way, but modern embryological studies have made it evident that the young and even embryos of a species may have specializations of their own that are not primitive. The young of bats have peculiar hooked teeth adapted for clinging to the fur of the mother as she flies. When the permanent teeth come in they are actually more primitive—in fact, much like those of non-flying insectivorous mammals believed to be similar to the ancestors of bats.

Further evidence of evolution is seen in the variation from region to region of widely dis-

persed animals and plants. Frequently these differences are clearly adaptive: animals of deserts are pale, matching the sands they frequent; those of heavy forests are darker; grouse of the arctic are white in winter, but the same species in Scotland does not have a white plumage; northern birds have longer, stronger wings for migrating. Such differences are at first slight (races or varieties), but often they have become greater during the course of time until new species are produced. Numerous species which vary only moderately on continents where the various stocks are less isolated have become trenchantly different after reaching islands such as the Philippines or West Indies where isolation from related populations is complete.

The above evidence from existing animals would be sufficient to support evolution as the most logical explanation of the observed facts. When fossils are included the evidence for evolution becomes more incontestable. Beginning in the Cambrian Period (or even before) roughly 500 million years ago (as estimated by the changes in radioactive rocks and other methods), we find fossils of relatively simple invertebrate animals. In later geological periods primitive fish, followed by amphibians (frogs, etc.), and reptiles, make their debut. Two specialized stocks of the latter gave rise to the mammals and birds. To be sure, the fossil record is incomplete. Only a minute fraction of animals and plants are preserved as fossils, chiefly those inhabiting or frequenting marine or marshy areas. Only those with hard parts, such as shells or bones, are normally preserved. Vast numbers of such fossils have been destroyed by geological processes (glaciation, mountain formation, etc.) and the percentage found by man is infinitesimal. The problem of the paleontologist may be likened to that of putting together a vastly complex jigsaw puzzle of which many pieces are missing and others broken and fragmentary. Despite these difficulties many phases of the fossil history of animals and plants are well known. The transformation of the horse over a period of about 60 million years from a small, 5-toed forest form to the specialized horse of today with one remaining toe (hoof) is well understood.

Some have objected that the crucial fossils linking important major groups are rarely found. This is only partially true and the gaps are slowly being filled. In fossils from South Africa the bridge from reptiles to primitive mammals is almost perfectly expressed. The first fossil bird, *Archaeopteryx*, had feathers and could undoubtedly fly but its skull, teeth, and other features are reptilian. It might be placed with either birds or reptiles and hence is a perfect "missing link." The transition from amphibians to reptiles is equally well known. Furthermore, the few



1. PRIMITIVE GANOID FISH
2. LOBE-FINNED FISH
3. GENERALIZED AMPHIBIAN
4. PRIMITIVE REPTILE
5. CYNODONT REPTILE
6. ARCHAIC MAMMAL

FROM FISH TO MAN

The skeleton of man, like that of all other vertebrate animals, is the passive part of the locomotor machinery, while the muscles and nerves are the active part. Comparative study of the skeletons of all known types of fossil and modern animals has made it possible to decipher the record of progress from fish to man. The series here shown does not form a direct line of descent from fish to man but each stage shown is the nearest to the direct line so far discovered.

The earliest vertebrates lived exclusively in the water and swam by undulating the body. The fins were projections of the skin and body-wall that served chiefly as rudders and balancers (Stage 1).

Gradually, in the swamp-living, air-breathing fishes, the pectoral and pelvic fins were transformed first into paddles (Stage 2) and then into limbs (Stage 3), as the animals crawled out of the swamps. After many ages the animals invaded the uplands (Stage 4) learning to crawl like turtles and lizards.

Next, they learned to raise the belly off the ground and run about (Stage 5). Then they climbed up into the trees and became very expert in running and leaping about among the branches (Stages 6, 7, 8).

At first these tree-living animals ran about mostly on top of the branches (Stage 7). Then some of their descendants adopted the "suspension grasp" as they began to swing from branch to branch. The gibbon (Stage 8) is rather overspecialized in this direction.

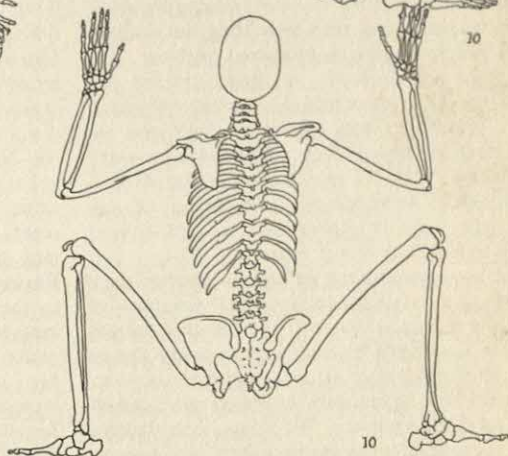
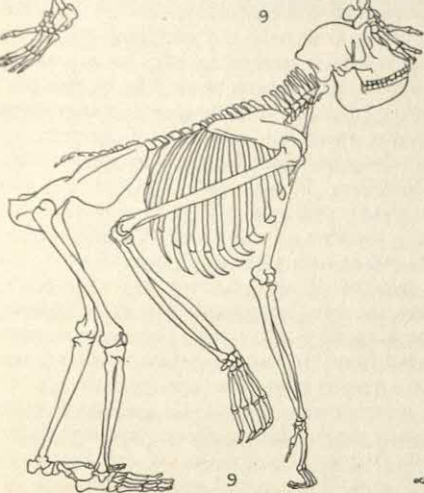
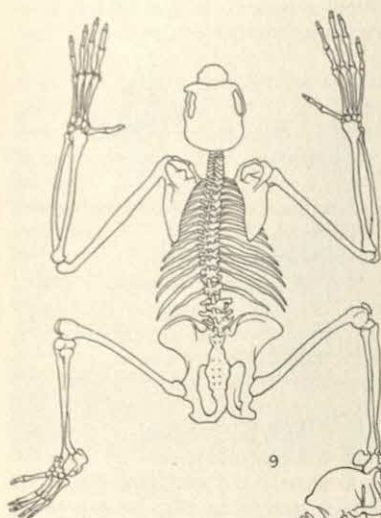
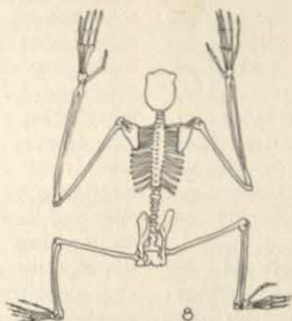
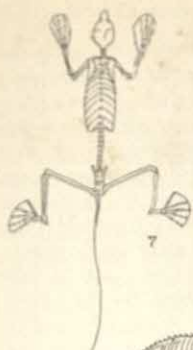
Avoiding extreme overspecialization for "brachiation" (swinging with arms) the ancestors of man came down from the trees, running perhaps occasionally on all fours but more and more often erect as do the gibbons when on the ground.

From his prehuman anthropoid ancestors, which were related to the chimpanzee (9) and the gorilla (9a) man has inherited his ability to hold the body erect or balanced on the hind legs (Stage 10). The forelimbs, being relieved from their former function as locomotor organs, were set free to serve the enlarging brain in defending the body and providing for its needs.

forms that bridge the gap between important major groups would be expected to be comparatively rare. They are outnumbered in the fossil record in the same way that the few experimental motor cars of such pioneers as Ford are outnumbered by the mass production of later, successful models. Similarly, birds, flowering plants, and other successful groups may have resulted from the great diversification of a few or even one species of a lower group that happened to

acquire new characters of great importance or value in survival. Special interest centers in the remains of fossil men and apes. Best known is the Neanderthal Cave Man (*Homo neanderthalensis*), a squat, heavy-set man, with decidedly apelike skull and protruding eyebrows. The size of his brain, however, was as great as in modern man. In the famous Java ape-man (*Pithecanthropus erectus*), the brain size was much smaller than in modern man (estimated at 950 as com-

7. VERY ANCIENT PRIMATE (NOTHAROTUS OSBORNII)
 8. PRIMITIVE ANTHROPOID (GIBBON)
 9a. ANTHROPOID APE (CHIMPANZEE)
 9b. ANTHROPOID APE (GORILLA)
 10. MAN



pared with almost 1,500 cubic centimeters). The known remains of this ape-man are rather fragmentary, though increased in recent years. Fortunately remains of a closely related species, *Pithecanthropus sinensis*, have been found in considerable numbers in caves in north China. A most interesting find, made just before the last war, was of giant teeth, several times larger than those of modern men and much more massive even than those of the gorilla. They were found in Chinese apothecaries' shops, destined to be ground for medicine in accordance with local superstition. These teeth are believed to be from caves in south China and are now considered to be those of a giant man, not an ape.

It is thus clear that the old search for "the missing link" has been in a measure fulfilled, especially when the above discoveries are compared with certain manlike fossil apes of South Africa. Moreover, almost everything in the behavior, anatomy, physiology, susceptibility to disease, and other characteristics of existing men and apes is very similar and points to their close relationship and common origin at no great distance in the geologic past.

Another aspect of evolution sometimes puzzling to the layman is the survival to the present in great profusion of primitive forms of life alongside their more specialized descendants. Bacteria and other microscopic beings approach the simplest type of living structure possible, yet abound today. This difficulty vanishes when we realize that the vast complexity of nature includes infinite numbers of different environments and niches, some suited only for primitive animals. It is well known that land-living backboned animals beginning with amphibians evolved from a peculiar group of fish in which the fins became gradually modified for support and the air bladder for use as a lung, thus permitting the gradual transfer from aquatic to terrestrial existence. Yet fish were not displaced by their modified descendants. The latter entered a new environment. Many primitive forms remain unchallenged by later developments though others have been exterminated. With the evolution of mammals and birds, reptiles were reduced from their dominant role (the "age of dinosaurs") to comparative rarity and unimportance today.

The above descriptive survey of evolution does not throw much light on the actual processes by which it advances. In seeking this explanation, Darwin first demonstrated that all living things vary, thus furnishing the materials for evolution. Genetics has enormously increased our knowledge of such variation. We know that changes or mutations do occur spontaneously in the genes, the small particles in the living cells which are the bearers of hereditary characters. Such changes

may affect any character or function of the organism. Some of them are beneficial, others detrimental or even lethal in their effects. Another fact, first emphasized by Malthus, is the great reproductive potential of all living beings. Even in such slowly reproducing species as man or the elephant, population increase would cause these species to overrun the earth in a comparatively short time if not held in check by high mortality. All organisms strive for life ("self-preservation is the first law of nature") and for reproduction of their kind. These factors combined result in a "struggle for existence" that leads to a natural selection of favorable variations and hence change and evolution. The reality of natural selection has recently been demonstrated experimentally. It should also be realized that cooperation and social behavior, especially among the members of the same species, may favor survival in competition with related species. The vast complex colonies of bees and ants are the extreme manifestation of such social tendencies.

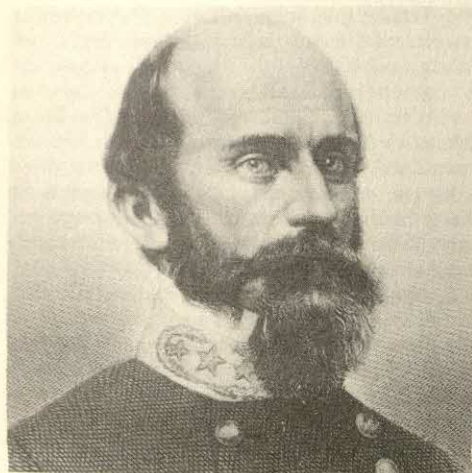
Evolution is a synthesizing concept that gives form and meaning to our knowledge of living beings. Today biologists are concerned not with "proving" evolution but with learning more of how and why it operates and with applying these principles to human welfare. See *Darwinism*; Huxley, Thomas H.; Lamarck, Jean Baptiste; Wells, Herbert George.

Ewald (*ä'vält*), GEORGE HEINRICH AUGUST VON, orientalist and theologian, born in Göttingen, Germany, Nov. 16, 1803; died May 4, 1875. After obtaining a liberal education, he was made instructor in the gymnasium of Wolfenbüttel, and in 1831 became professor of philosophy in the Univ. of Göttingen. While there he incurred the displeasure of the authorities for opposing the King of Hanover, who did not favor the constitution, and was removed in 1837 for expressing liberal political opinions. In 1838 he became professor of philosophy at Tübingen and after three years was appointed instructor of theology, in the teaching of which he came in conflict with the Hegelians, Pietists, and Catholics. He was again chosen professor at Göttingen in 1848, became a member of the North German parliament, and as such gave active support to Protestant reforms. When Hanover was annexed to Prussia, in 1866, he refused to swear allegiance to the king of that country, and was therefore removed from his position. Seldom has a scholar made a deeper impression upon the thought of his generation than Ewald. He published many important works, among them: "History of the Jewish People," "Antiquities of the People of Israel," and "Treatise of Languages."

Ewell (*ü'el*), BENJAMIN STODERT, mathematician, born in Washington, D.C., June 10, 1810;

died in James City, Va., June 19, 1894. He was graduated from West Point at the age of 22, and served with distinction as professor of mathematics and philosophy. In 1836 he became professor at Hampden-Sydney Coll., and later held like positions in Washington Coll. and William and Mary Coll., accepting the presidency of the latter in 1854. After serving in the Confederate army, he was again elected president of William and Mary Coll., which position he held until 1888. Later he obtained favorable recognition from Hobart Coll. and the Royal Historical Society of England.

Ewell, RICHARD STODDERT, Confederate soldier, born in Georgetown, D.C., Feb. 8, 1817; died Jan. 25, 1872. He was graduated from West Point, served with distinction in the Mexican War, and later took part in the war against the Apaches in New Mexico. At the beginning of the Civil War



RICHARD S. EWELL

he resigned his commission as captain and entered the Confederate army, in which he attained the rank of major general. While serving under Jackson, in 1862, he lost a leg, but after Jackson's death he took command of the second army corps and became lieutenant general. His services to the Confederate cause were especially valuable at Winchester, at Gettysburg, in the Wilderness, and at Spottsylvania Courthouse. Later he was given command of the department of Richmond. After being defeated, he was taken prisoner and his whole command was captured by Sheridan in 1865. His death occurred in Springfield, Tenn., where he settled after the war.

Ewing (*ū'ing*), JAMES, pathologist, born in Pittsburgh, Pa., Dec. 25, 1866; died in 1943. He was graduated from Amherst Coll. before entering the Coll. of Physicians and Surgeons at Columbia Univ., from which he received his degree in

1891. He interned at the Roosevelt Hospital, entered the study of pathology, and became professor of pathology at Cornell Medical Coll. in 1899, remaining there until his death. One of the world's foremost cancer authorities, and pioneer in the use of radium to treat the disease, he was important as director of the Roosevelt Memorial Hospital (1913-39), in developing that institution into one of the world's best-known centers for research and treatment of cancer. His treatise on tumors, "Neoplastic Diseases" (1918), is still the standard reference work in the field.

Ewing, THOMAS, statesman, born in Ohio County, Virginia, Dec. 28, 1789; died in Lancaster, Ohio, Oct. 26, 1871. At an early age he was taken to Ohio, where he worked in the Kanawha salt works, and earned enough to enable him to take a degree at Ohio Univ. Later he studied law, was admitted to the bar in 1816, and entered



THOMAS EWING

upon a successful practice in the courts of Ohio and the Supreme Court of the U.S. He was elected to the U.S. Senate in 1831, where he served six years, and later was made Secretary of the Treasury in the Cabinet of President Tyler. President Taylor appointed him Secretary of the Interior in 1849, he was the first to hold that office after the creation of that department, and held that position until the death of the President. Later he was elected to the U.S. Senate, where he opposed Clay's compromise bill and the Fugitive Slave Law, and advocated the abolition of slavery in the District of Columbia. His views on national banks were antagonistic to the policy of President Taylor, but in his postal policy he was vigorously supported and was instrumental in securing many improvements in the service. He retired from the Senate in 1851 and resumed the practice of law in Lancaster, where he died.

Exact Sciences (*ĕg-zăkt' sĭ'ens-es*), term designating mathematics, astronomy, physics, mechanics, and chemistry, in short, those sciences the results of which can be measured and expressed exactly by figures.

Excavator (*ĕks'kă-vă-tēr*), a machine used for excavating earth. The four principal types of excavators are: (1) power shovels; (2) power drag lines; (3) grabbing cranes or clam shells; (4) dredge excavators.

Excess Profits Tax (*ĕk-sĕs'*), a tax imposed on business profits which exceed "normal" or "standard" profits, generally defined either as some reasonable percentage return on invested capital or as the average profits earned during some "base-period." An excess profits tax was levied by the U.S. in both World War I (taxable years 1917 to 1921) and World War II (taxable years 1940 to 1945). A special excess profits tax was also imposed from 1933 to 1945, principally to serve as a check on taxpayers' declared valuations of capital stock under the concurrent capital stock tax.

Exchange (*ĕks-chān'*), the division of economics which treats of the interchange of articles of value, as in commerce, or the transfer of commodities between different parties. The conditions peculiar to life confine the sphere of human activity largely to a particular place, while human wants are satisfied only by the productions from many different regions. From this localization of the efforts of man and the vast extent of his needs comes the necessity of transportation and trade. To be equitable, the exchange must be mutual and voluntary between two or more parties, and the right of property must exist. These are primary conditions, since transfer without a consideration is a gift, involuntary relinquishment is robbery, and no exchange can be effected unless the parties interested possess a right to the property exchanged.

The general law of exchange requires that value be given for value. In this connection the term *value* is used in a relative sense. It is defined as the estimate of the sacrifice requisite to come in possession of a desired object, and is sometimes spoken of as the *cost of production*. Hence, prices depend upon the *supply* and *demand* of a given article, or the quantity offered for sale on the one hand and the desire to possess on the other. It is understood that the desire must be more than mere longing, and must be attended by ability to purchase.

To promote exchange is one of the prime objects of government. In order to promote commerce and bring about the most beneficent results, legislation must aim to foster international and domestic trade, provide a wholesome monetary system, and regulate banking. It must guard against the evils which are likely to re-

sult from the monopolistic control of certain avenues of trade and transportation, as well as the limitation of certain lines of production for the purpose of controlling prices.

The term *exchange* is likewise applied to a class of transactions in commerce by which the debts of persons or corporations located in a distant city or country are canceled by a bill of exchange, as a check or draft, without the actual payment of money. This is effected by the payer depositing specie or its equivalent in a bank for the purpose of forming a basis whereby the checks or drafts issued can be redeemed. The greatest volume, both of domestic and foreign business, is transacted by this system of exchange.

Exchange Stabilization Fund (*ĕĕĉ-chāng' stă-bi-li-ză-shŭn fŭnd*). Section 10 (b) of the Gold Reserve Act of Jan. 30, 1934, created out of certain Treasury receipts an Exchange Stabilization Fund of \$2,000,000,000. The Secretary of the Treasury, as administrator of this fund, is authorized for the purpose of stabilizing the exchange value of the dollar, to deal in gold and foreign exchange, and other instruments of credit and securities. The U.S. Treasury's Division of Monetary Research is responsible for the economic and financial work connected with the negotiation of exchange stabilization agreements made by the U.S. with foreign governments and central banks for the purpose of promoting international exchange stability.

Exchequer (*ĕks-chĕk'ĕr*), from old French, *eschequer*, meaning chessboard; in the United Kingdom, the Treasury department; Chancellor of the Exchequer is the title of the English minister of finance. The term is derived from the ancient method of reckoning accounts with counters on a square-marked table cover.

Excise (*ĕk-sĭz'*), a tax levied upon the sale or consumption of commodities or services or the exercise of an occupation. When levied upon commodities, the tax may be imposed on both domestic and imported goods or solely on domestic goods, although in England the term is limited to duties on articles of home production. Taxes levied only on imports are generally called customs. The excise system of England dates from 1643, when the Long Parliament levied duties on a large variety of articles to support the army against Charles I. After restoration of the monarchy, various forms of the excises were continued, and subsequently they became very widespread and oppressive. Sir Robert Peel headed a movement to repeal a number of the excise tax laws, and many of these duties were reduced or abolished after 1844. Subsequent to this, the main source of excise revenue became alcoholic beverages. The use of excise taxes is widespread, common sources of such revenue being alcoholic beverages, gasoline, and tobacco.

EXCOMMUNICATION

UNITED STATES. Excise taxes were levied by the colonial governments and the first Federal excise law, which was advocated by Alexander Hamilton, was adopted after an excited debate in 1791. The law levied taxes, effective July 1, 1791, on distilled spirits and carriages. The tax on distilled spirits ranged from 9 to 25 cents per gallon upon spirits made from domestic articles, and from 11 to 30 cents per gallon upon spirits distilled from molasses, sugar and other foreign materials. Producers owning stills located in the country districts were permitted the option of paying a yearly duty of 60 cents per gallon on the capacity of each still. By the use of improved methods of production, distillers were able to obtain a lower rate of tax under this provision. Opposition to the tax on distilled spirits caused the Whiskey Insurrection in western Pennsylvania in 1794. Additional excises were added in 1794, but all excises were repealed early in 1803, in the administration of Thomas Jefferson. Excises were revived during the War of 1812 with taxes on such things as sugar, distilled spirits, instruments of exchange, carriages, and retail liquor dealers. All these duties were repealed in 1817 and no further excises were levied until 1862, during the Civil War. Many excises were enacted during the war but most of them (the notable exceptions being the taxes on liquor and tobacco) were gradually repealed after the war. The Spanish-American War saw the temporary imposition of additional excises, and World War I again resulted in the enactment of new excises. Most of the wartime excises were subsequently repealed, but the depression and World War II again gave rise to the extensive use of excises. Alcoholic beverages and tobacco have continued to be the main sources of excise tax revenue for many years despite widespread variations in the number and rates of the excises.

Excommunication (*ěks-kū-mū-nī-kā'shūn*), in the Roman Catholic Church, exclusion from Communion (*q.v.*). In a broader sense, less severe measures, such as exclusion from certain liturgical acts, have also been termed excommunication. Formerly considered a grave punishment, excommunication later lost its significance when the popes began to use it as a political measure against their adversaries. The right to pronounce full excommunication is reserved to the pope, who also has the power to absolve from it.

In the Presbyterian churches of Scotland, excommunication means the separation of an individual from the ecclesiastical community.

Executive (*ěg-ěk'ū-tiv*), the branch of a nation, state, municipal government, or corporation which controls the administrative functions.

The term *executive* is applied to the chief magistrate, whether he is a governor, president, king, or emperor, and extends more or less to the



Courtesy British Information Services, N. Y.

HIGH STREET, EXETER

These houses with overhanging upper stories and carved wooden façades date back to the 16th century

principal officers in all civil institutions. In the U.S. the chief executive power is vested in the President, who is assisted by a Cabinet which has advisory functions. The President is by the terms of the Constitution made ex-officio commander-in-chief of the army and navy of the U.S. and of the militia of the several states, when engaged in the actual service of the nation. The principal officer of each department of the government may be required to furnish to the President an opinion in writing on questions relative to public interest. With the advice and consent of the Senate, the President is empowered to make treaties and nominate certain civil, military, and naval officers of the U.S. Besides the duties especially enumerated in the Constitution, it devolves upon the President to control the subordinate departments whose heads are known as Attorney General, Postmaster General, and Secretaries of State, Treasury, Interior, War, Navy, Agriculture, Commerce, and Labor. The business of the government is carried on through these departments under the direction of the President, statutes are enforced, and special laws passed by Congress are put in operation.

Exeter (*ěk'se-tēr*), a city and county borough, capital of Devonshire, England, on the Exe River, 37 m. N.E. of Plymouth. The largest market town in southwest England, it is a rail and agricultural center. A canal connects the city with the tidal estuary, providing convenient access

for ships and steamers. The manufactures include metal and wood products, leather goods, and agricultural machinery. Its long and turbulent history—when it was known as *Isca Damnoniorum*—is reflected in the ruins of Saxon walls, the Norman castle, the 12th-century cathedral containing the Exeter Book (a compilation, ca. 1000, of Old English religious and secular writings, chiefly poetry), the guildhall, and the 14th-century bishop's palace. Located here is the University Coll. of the Southwest. Probably a trading center and fort in pre-Roman days, Exeter was a center of the Britons' resistance to the Anglo-Saxon invasion. William the Conqueror captured it in 1068. It was a Royalist stronghold (1642-46) during the civil wars, and in World War II it was the site of the largest U.S. Navy supply depot in England. Population, 1951, 75,479.

Exeter College, a department or college of Oxford Univ., in Oxford, England. Founded in 1314 by Walter de Stapledon, bishop of Exeter, it was known as Stapledon Hall from 1315 to 1404, when it took its present name. Through the gifts of Sir William Petre, it was enlarged (1565-66), and in the 17th century it became a center of Puritanism (*q.v.*). Its well-known graduates have included William Temple, archbishop of Canterbury, and William Morris and Sir Edward Burne-Jones, who decorated the 19th-century chapel with the "Star of Bethlehem" tapestry.

Exhibition (*ĕk-sĭ-bish'ŭn*). See *Exposition*.

Exhibitionism, a term in psychology characterizing one who feels compelled to display parts of his or her body in order to awaken sexual feelings in another person. Generally, the sexual organs proper are shown for this purpose.

Psychoanalytical research has found that exhibitionistic tendencies prevail in childhood as part of infantile libido (*q.v.*). With adults, acts of exhibitionism prove remains of an infantile attitude and must generally be considered as a substitute for sexual action. While exhibitionism in this active form may be considered pathological, traces of a tendency towards exhibitionism may be found among almost all extrovert (*q.v.*) persons. Actors, singers, public speakers act in a somewhat exhibitionistic way, although in this case the action is not intended to arouse sexual feelings, but to convey one's personality.

Exile (*ĕk-sĭl*), term meaning the banishment of individuals or groups of people from their home country. Often in history, groups of people have been compelled to leave their respective countries for political or religious reasons. The most famous examples are the exile of the Jews to Babylonia (586-538 B.C.) and the various exiled groups who have settled in this country since the start of its modern history. The most recent example is the forced exile of the Jews by Hitler

in Germany and the "DP's," or displaced persons, who had left their homes to escape the invading Nazi armies or were forced by the Germans into slavery.

Exile as a form of political punishment has also been employed against individuals, *e.g.*, the exile of Napoleon I to the island of Elba (1813) and later to the island of St. Helena (1815); the exile of the French poet Victor Hugo and of the German composer Richard Wagner, and the exile of many Russians to Siberia.

Existential Psychology (*ĕg-zĭs-tĕn'shal sĭ-kŏl'ŏ-gĭ*), a system of psychology which believes that the only possible way of learning about psychological facts is self-observation. The task of psychology, therefore, is reduced to the description of one's own experiences and to the attempt to order and classify them.

Existential Philosophy, term signifying a philosophy describing things as they appear, a trend in philosophy based on ideas of Kierkegaard (*q.v.*) and the German philosophers, Heidegger, Jaspers, and others, which first gained importance after World War I and which took different forms in different countries. Existential philosophy experienced a revival after World War II, especially in France, where almost all of the younger philosophers who had participated in the Resistance movement subscribed to it. In this country, the pragmatism (*q.v.*) of William James (*q.v.*) and Charles Peirce (*q.v.*) also developed in the direction of existential philosophy.

Existential philosophy itself represents a concept of strongest denial of any metaphysical ideas, as well as a denial of Kant's *Ding an sich* (the thing in itself). Since not only the knowledge, but even the existence of the thing in itself is denied, the only task of philosophy, according to existential philosophers, is the description of things as they appear to us. The appearance of things, however, is based on our ability to perceive and to react, and this ability itself is conditioned by our environment and by the physical state of our body and our nervous system. Thus, no absolute values can be recognized by man and philosophy becomes almost identical with psychology. Because of this near identity, the ideas of the German psychologists of the 19th century, such as Wilhelm Wundt (*q.v.*), those of the physicist Ernst Mach, and those of the Americans William James, and John Dewey (*q.v.*), could be cited in connection with existential philosophy. See *Sartre*, *Jean-Paul*.

Exodontia (*ĕk-sŏ-dŏn'shĭ-ă*). See *Dentistry*.

Exodus (*ĕk-sŏ-dŭs*), the second book of the Pentateuch and of the Old Testament. It consists of two distinct parts, which include an account of the deliverance of the Israelites from Egypt and a description of the giving of the law. The book begins with the death of Joseph, re-

counts the oppression of the Hebrews in Egypt, the birth and call of Moses, the deliverance from Egypt, and the way to Sinai. It includes a description of the tabernacle, the wanderings in the desert, and the establishment of the Covenant with Jehovah. Tradition ascribes the authorship of the Book of Exodus to Moses.

Exogen (*ĕk's'ô-jen*), a term used to designate a plant of the group usually known as DICOTYLEDONS. The term refers to the method in which dicotyledons form their stem, by successive additions around a central pith (see *Wood*). The name dicotyledon refers to the embryonic structure of one of these plants: the embryo has two seed leaves, or cotyledons, occurring opposite one another (see also *Cotyledon*). The leaf of a typical dicotyledon has a netlike pattern of veins, and its flower (*q.v.*) parts occur in multiples of two, three, four, or five. The group (a class of the angiosperms, themselves a subdivision of the spermatophytes) includes the potato, the cabbage, the orange, and many trees. See also *Plants; Trees*.

Exophthalmos (*ĕk-s'ôf-thāl'môs*), in medicine, abnormal protrusion of the eyeballs, one of the symptoms of hyperthyroidism. See also *Thyroid*.

Exorcism (*ĕk's'ôr-sîz'm*), in the Roman Catholic Church, and in many other religions, a term signifying the act of driving out an evil spirit. Exorcism, little practiced today, was generally exercised in the name of Christ against the devil. Almost all forms of worship know the procedure in some more or less primitive form. The supposed ability to practice exorcism granted great powers to the so-called medicine men.

Exorcist (*ĕk's'ôr-sîst*), in the Roman Catholic Church, a term especially applied to the second of the four Minor Orders (*q.v.*), referring to this order's function of practicing exorcism (*q.v.*).

Exoskeleton (*ĕk-s'ô-skĕl'ê-tūn*), in zoology, hard covering of an animal's body, protecting inner organs. It is found only in the lower forms of life. The best-known examples are the shells of the crustaceans and the protective shell of the turtle.

Exosphere (*ĕk's'ô-sfēr*). See *Atmosphere*.

Expansion (*ĕk's-pān'shūn*), in physics, the increase in bulk which a body undergoes in consequence of a change in its temperature, so that it occupies a greater space while the weight remains the same. Heat is the most common cause of expansion. Water in cooling ceases to contract at 39.2° F. and, in lowering its temperature, it expands again until frozen, when the expansion reaches about one-eleventh of its original bulk. Thus water, when at its greatest density, which is at 39.2° F., presents the curious phenomenon of expanding whether heat or cold be applied. Expansion is common to all substances, though gases

expand more than liquids, and liquids more than solids. Winds are caused by the air expanding under the heat of the sun, and the phenomenon of oceanic currents is caused by the expansion of water.

Expatriation (*ĕk's-pā'trî-ā-shūn*), the voluntary renunciation or abandonment of nationality and allegiance. Expatriation is a matter of intent on the part of the person concerned, which must be shown by either naturalization in a foreign state, in conformity with its laws, or the taking of an oath of allegiance to a foreign state. A child born in the U.S. who is taken during his minority to the country of his parents' origin, where his parents resume their former allegiance, will effect his expatriation from American citizenship if—on attaining his majority—he elects to swear allegiance to the government of the foreign country.

Expectation (*ĕk's-pĕk-tā'shūn*) in a game of chance, the product of the expected gain multiplied by the probability of obtaining such a gain. Thus, if one ticket in a lottery of 100 tickets will win a prize of \$10, the expectation of a person who buys one ticket is $\frac{1}{100} \times 10$ dollars or 10 cents. Thus 10 cents would be the mathematically fair price to pay for such a ticket.

Expectation of Life, or LIFE EXPECTANCY, or AVERAGE FUTURE LIFETIME, is the average number of years remaining to be lived, at any age, by those surviving to that age, on the assumption that the death rates observed during a given year, or base period, will continue. It is found by dividing the number of years that will be lived by all individuals of a given age x by the number of individuals of age x . Contrary to popular belief, insurance premiums are not calculated from the expectation of life, but are based directly upon death rates and interest rates. The expectation of life, however, is the most usual measure of the comparative longevity of different populations.

From primitive times to the present, longevity has been increasing. Historical records show that the primitive men of the early iron and bronze ages had an expectancy at birth of 18 years, the Roman of 2,000 years ago 22 years, Europeans 500 years ago less than 35 years, and Englishmen about 100 years ago 41 years. From 1900 to 1956 the life expectancy of white males in the U.S. increased by almost 21 years, from 46.6 to 67.3 years; that of white females increased by 25 years, from 48.7 to 73.7 years.

At birth, a white male in the U.S. can thus expect to live to more than age 67, and a white female, to almost age 74. This is the average number of years that newborn babies can be expected to live. As an individual grows older, the length of his average future lifetime decreases, but it decreases by less than the number of years he has lived. For example, at age 15 a

EXPECTATION OF LIFE

white male can expect to live, on the average, 54.8 more years, or to an age of almost 70; at age 40 a white male can expect to live, on the average, 31.6 more years, or to an age of more than 71; and at age 65 a white male can expect to live to the age of almost 78. These figures and data for other ages are given in the table below, which shows the variation in life expectancy with age, according to estimates for 1956 by the National Office of Vital Statistics of the Public Health Service, U.S. Dept. of Health, Education, and Welfare.

VARIATION IN LIFE EXPECTANCY WITH AGE

Age	Total	White		Nonwhite	
	Population	Males	Females	Males	Females
0	69.6	67.3	73.7	61.1	65.9
1	70.4	68.2	74.2	63.1	67.4
5	66.7	64.4	70.5	59.6	63.9
10	61.9	59.6	65.6	54.8	59.1
15	57.0	54.8	60.7	50.0	54.2
20	52.3	50.1	55.9	45.4	49.4
25	47.6	45.5	51.1	41.0	44.8
30	42.9	40.9	46.2	36.7	40.3
35	38.3	36.2	41.4	32.5	35.9
40	33.7	31.6	36.7	28.5	31.8
45	29.3	27.3	32.1	24.6	27.8
50	25.1	23.1	27.7	21.1	24.1
55	21.1	19.3	23.4	17.8	20.7
60	17.5	15.9	19.3	15.2	17.9
65	14.2	12.9	15.5	12.9	15.3
70	11.3	10.3	12.2	11.5	13.6
75	8.7	7.9	9.2	10.2	11.9
80	6.5	6.0	6.6	8.7	9.9
85	5.0	4.7	4.9	8.0	8.7

NATIONAL VARIATIONS

COUNTRY	LIFE EXPECTANCY ¹	TIME PERIOD
<i>North America</i>		
Canada	70.1	1955
Costa Rica	55.7	1949-51
El Salvador	51.2	1949-51
Greenland	34.9	1946-51
Guatemala	43.7	1949-51
Mexico	48.7	1949-51
Puerto Rico	68.3	1955
<i>South America</i>		
Argentina	59.2	1947
Chile	51.4	1952
Ecuador	52.0	1949-51
Venezuela	47.0	1946
<i>Europe</i>		
Austria	64.4	1949-51
Belgium	64.6	1946-49
Czechoslovakia	63.2	1949-51
Denmark	68.9	1946-50
Finland	66.6	1951-55
France	68.2	1954-55
Germany (East)	67.1	1952-53
Germany (West)	66.5	1949-51
Hungary	66.7	1955
Ireland	65.8	1950-52
Italy	57.5	1935-37
Luxemburg	63.7	1946-48

¹ At birth.

EXPLORATION

COUNTRY	LIFE EXPECTANCY ¹	TIME PERIOD
Netherlands	72.5	1953-55
Norway	71.0	1946-50
Poland	61.4	1952-53
Portugal	58.0	1949-52
Spain	61.2	1950
Sweden	72.0	1951-55
Switzerland	68.6	1948-53
United Kingdom		
England and Wales	70.5	1956
Scotland	68.6	1956
Northern Ireland	67.1	1950-52
U.S.S.R.	64	1954-55
Yugoslavia	56.3	1950
<i>Africa</i>		
Belgian Congo	38.8	1950-52
Union of South Africa	66.0	1945-47
(white population)		
<i>Asia</i>		
Ceylon	59.9	1954
Cyprus	66.2	1948-50
India	32.1	1941-50
Israel	70.8	1955
(Jewish population)		
Japan	66.1	1955
Philippines	51.2	1948
Thailand	50.3	1947-48
<i>Oceania</i>		
Australia	68.4	1946-48
New Zealand	70.4	1950-52
(European population)		

¹ At birth.

Exploration (*ěks-plò-rá'shún*), the purposeful search for information about unknown regions. The word is used chiefly in connection with geography, but any form of research is, in a broad sense, exploration. Geographical exploration has been stimulated by many things. Formerly, exploration was closely related to war, conquest of territory, economic and political gain, and religion. In recent years, the trend has been toward exploration for purely scientific reasons, but prestige and politics still have some influence.

The origins and names of the first explorers have been lost in antiquity. Asians discovered North America perhaps 10,000 years before writing was invented. Certainly the Egyptians, Phoenicians, and Cretans were among the early exploring peoples, and the Greeks and Romans carried on a great amount of work. The Greek explorer, Pytheas, about 330 B.C., is credited with being the first Mediterranean man to reach as far north as the British Isles, and Alexander the Great was a major explorer for military purposes.

During recorded history there have been many surges or great waves of exploration. The Romans, starting about 200 B.C., reached and conquered Britain by A.D. 50. There was a surge in China about 138 B.C. The Moslem period was from A.D. 692 to 714. The Vikings, between 750 and 1002, sailed eastward to the White Sea and south to Morocco, and Leif Ericsson reached the

Atlantic coast of North America about 1002 (see also *Vinland*).

In the 11th century, the Crusades helped exploration by crossing much little-known territory, and Marco Polo did remarkable work in the 13th century. The great age of exploration, in the 15th and 16th centuries, was helped by Prince Henry the Navigator and his school of navigation and cartography. Africa was circumnavigated by Bartolomeu Dias in 1487-88. Vasco da Gama sailed to India in 1498, and Christopher Columbus reached the West Indies in 1492. They were followed by the Conquistadors—Vasco Balboa, Hernando Cortez, Francisco Pizarro, and many others. In 1519 Ferdinand Magellan led an expedition that circumnavigated the globe. The search for a northern route to China led to the work of John and Sebastian Cabot, Willem Barents, and Jacques Cartier. Two Hollanders, Willem Jansz and Abel Tasman, discovered Australia and Tasmania. The famous Capt. James Cook followed and explored Australia and the Pacific Islands.

In the 17th and 18th centuries, much of the coast and the interior of North America was explored. Some of the important men who did this were Jean Nicolle, Robert, Sieur de La Salle, Louis Joliet, Jacques Marquette, Sir Walter Raleigh, John Smith, George Calvert (Lord Baltimore), and Henry Hudson. In the northwest, George Vancouver, Simon Fraser, Meri-



Courtesy The Bettmann Archive, N.Y.

17th-CENTURY EXPLORATION

La Salle takes possession of Louisiana in 1682

wether Lewis, George Clark, and John Frémont were but a few of the great explorers.

In the 19th century there was a great interest in interior Asia, South America, Africa, the arctic, and the antarctic. In the history of arctic exploration, men like Sir William Parry (1819), Sir John Ross (1818), and many others, prepared the way for Robert Peary's dash to the North Pole on April 6, 1909. Roald Amundsen

reached the South Pole on Dec. 14, 1911, and was closely followed by the heroic but ill-fated Robert Scott expedition.

The development of the airplane and of photogrammetry (making of maps from aerial photographs) were great steps forward in the techniques of exploring. The conquests of Mt. Annapurna in 1950 and Mt. Everest in 1953 were heroic feats of mountain exploration.

The International Geophysical Year (*q.v.*) has so far been the most extensive scientific exploration year ever attempted by man to study the earth's structure and shape, heat and water regimens, and the physics of the upper atmosphere.

Although this planet is not fully known as yet, the surge of exploration is in the direction of probing space with various forms of rockets and satellites, and through this exploration more will be learned about the earth. See also *Aviation: Space Travel; Earth Satellite; World History*; and separate articles on the individual explorers named above.

Explorer (*eks-plō'ēr*), the popular name for the earth satellites launched by the U.S. Army during the International Geophysical Year (*q.v.*). Thus, the satellites whose scientific designations were 1958 Alpha, Gamma, and Epsilon were also known as Explorers I, III, and IV. Each of these satellites was placed in orbit by a modified Jupiter-C launching vehicle, which was developed jointly by the Army Ballistic Missile Agency and the Jet Propulsion Laboratory of the California Inst. of Technology. The overall length of the launching rocket was 823.3 in. The first stage was a modified Redstone liquid-propellant rocket 672.8 in. long and 70 in. in diameter. The upper-stage assembly, which was separable from the carrier vehicle, was 150.5 in. in length. After the main power plant was expended, it separated from the nose section containing the upper stages together with suitable attitude controls for use during the coasting period. As the nose section reached the apex of its ballistic trajectory, the second-stage rockets fired, followed in rapid succession by the third-stage rockets, then by the fourth-stage rocket, the empty shell of which remained attached to and formed part of the satellite body. The upper stages were spin-stabilized at 700 r.p.m., in order to reduce the effect of thrust misalignment. The second and third stages consisted of clusters of solid-propellant rockets; the final stage was a single solid-propellant rocket.

Explorer I, the first U.S.-I.G.Y. satellite, was 80 in. long, 6 in. in diameter, and weighed 30.8 lb. after burnout. It was placed in orbit at 10:48 P.M. E.S.T. on Jan. 31, 1958, and obtained data on cosmic rays, temperatures, and micrometeors. Initial perigee was 224 m., apogee 1,573 m., and period 114.8 min. Explorer II failed to go

into orbit. Explorer III was basically similar to Explorer I except for inclusion of a miniature tape recorder for storing cosmic-ray data. It was placed in orbit March 26, 1958, and had an initial perigee of 118 m., apogee of 1,740 m., and period of 115.9 min. Explorer IV, also 80 in. long and 6 in. in diameter, was placed in orbit July 26, 1958. It weighed 37.1 lb. and had an initial perigee of 163 m., apogee of 1,373 m., and period of 110.21 min. It was instrumented to measure corpuscular radiation at various levels of intensity and to observe artificial radiation resulting from the explosion at high altitudes of three atomic devices. See also *Astronautics; Earth Satellite; Rocketry; Vanguard*.

Explosives (*ěks-pló'sivs*), substances which may expand violently with the production of great pressure and a noise. The U.S. Army technical manual defines an explosive as a "substance, which when subjected to heat, friction, percussion or other suitable initial impulse, undergoes a very rapid chemical transformation, forming other substances, mainly or entirely gaseous, which at the moment of their formation tend to occupy a volume very much greater than that of the original substance."

The first explosive was black powder or gunpowder, possibly developed from "Greek fire," a mixture of pitch, oils, and sulfur, used in the 8th century. After nitroglycerine was discovered in 1847 and nitrocellulose was discovered in 1838, Alfred Nobel (1833-96) developed these two materials into practical nitroglycerine explosives, particularly dynamite. Since that time, explosives have been developed for many purposes, both for industrial use in peacetime and for military use. The important commercial explosives are black powder, dynamite, blasting gelatin, compositions containing ammonium nitrate as the oxidizing agent, and the initiators, fulminate of mercury, diazodinitrophenol (DDNP), and pentaerythrite tetranitrate (PETN). Important military explosives are smokeless powder, trinitrotoluene (TNT), amatol, ammonium picrate, nitrostarch, tetryl, picric acid, and the initiators, mercury fulminate and lead azide. The U.S. Dept. of the Interior classifies the U.S. production of explosives under the headings of black blasting powders; permissible explosives—those for safe mining of coal; and high explosives.

Early atomic bombs were equivalent in explosive power to ca. 20,000 tons of TNT. Hydrogen bombs currently produced are equivalent to over 10,000,000 tons of TNT. See *Gunpowder*.

Exponent (*ěks-pó'něnt*), in mathematics, a number indicating the power to which another number, called the base, is raised. The exponent is written to the right and slightly above the base; e.g., the second power of a is denoted by a^2 .

If the exponent is a positive integer, it indicates

the number of times the base is to be taken as a factor to obtain the power. Thus $a^2 = a \times a$, $a^3 = a \times a \times a$, $a^4 = a \times a \times a \times a$, and in general $a^n = a \times a \times a \times a \times \dots \times a$ to n factors. . . $\times a$. In elementary algebra the following properties of positive integral exponents are proved:

1. $a^m \times a^n = a^{m+n}$
2. $a^m \div a^n = a^{m-n}$
3. $(a^m)^n = a^{mn}$
4. $(ab)^m = a^m \times b^m$

Later the concept of an exponent is broadened to include fractional, negative, and zero exponents. Definitions are then chosen in such a manner that the properties (see 1 to 4, above) for positive integral exponents will also hold for these new exponents. For example, the definition which is selected for $a^{1/2}$ is chosen so that the first property, $a^m \times a^n = a^{m+n}$, will apply if $m=n=1/2$. Since we want $a^{1/2} \times a^{1/2}$ to equal a , we assign to $a^{1/2}$ the meaning $\sqrt{a}$, for $\sqrt{a}$ is the number which, if it is multiplied by itself, will yield the product a . In a similar manner we choose that $a^{1/4}$ shall mean $\sqrt[4]{a}$, $a^{1/3}$ shall mean $\sqrt[3]{a}$. Similar reasoning leads us to define $a^{2/3}$ as $\sqrt[3]{a^2}$, $a^{3/2}$ as $\sqrt{a^3}$, etc., and, in general, we define $a^{m/n}$ as $\sqrt[n]{a^m}$.

In order that the properties 1 to 4 will apply to negative exponents, a^{-n} is defined to be $\frac{1}{a^n}$:

For example, $a^{-2} = \frac{1}{a^2}$, $a^{-3} = \frac{1}{a^3}$, $a^{-1} = \frac{1}{a}$, etc.

In order that the properties 1 to 4 will apply to a zero exponent the definition $a^0 = 1$ is chosen.

Exponential Equation (*ěks-pó'něnt'shál' ě-kwá'zhún*), an equation which has a variable as an exponent and is of the form $y = a^x$. It is solved by taking the logarithm of both sides. Thus if $8 = 2^x$, then $\log 8 = x \log 2$ and $x = \log 8 \div \log 2$.

Exponential Function (*jūngk'shún*), a function of the form a^x , where a is any positive number except 1; that is, a constant raised to a variable power. The graph of the exponential function crosses the y axis at $(0, 1)$ and to the right of the y axis its height increases more and more rapidly. To the left of the y axis the graph approaches the x axis as an asymptote. The exponential function is the inverse function to the logarithmic function. One of the most useful exponential functions is e^x in which the constant e has the approximate value 2.71828. Exponential functions have numerous applications, as in connection with the compound interest law and with the phenomena of growth and decay, for example in the growth of populations such as bacteria and in the decay of radioactive substances.

Export-Import Bank of Washington (*ěks'-*

EXPORTS

pórt-im'pórt), a Federal agency, created to encourage foreign commerce. The bank is authorized to make loans in connection with the development of export-import trade; to deal in securities, bills of exchange, notes and drafts; to purchase and sell coin and bullion; to issue letters of credit; and, in general, to assist in financing foreign trade. Established (1934) as a temporary measure, it was made an independent agency of the U.S. government in 1945. The bank is authorized to have a capital stock of \$1,000,000,000, and it may borrow from the U.S. Treasury up to an additional \$4,000,000,000. The management of the bank is vested in a five-member board of directors, appointed by the President with the consent of the Senate.

Exports (*ěks'pórts*), in economics, commodities produced and/or manufactured in one country and shipped to another. Among the leading commodities exported from the U.S. are cotton, tobacco, meat products, dried and evaporated fruits, wood pulp, iron and steel, rubber manufactures, industrial machinery, firearms and ammunition. At foreign point of destination, exports become imports. See also *Balance of Trade*; and separate articles on individual countries.

Exposition (*ěks-pō-zish'ūn*), a national or international exhibition of works of art and products of industry for the purpose of stimulating public interest and expanding trade. One of the first industrial expositions on a national basis was held at Paris in 1798. In the first half of the 19th century, many expositions were held in America and Europe. The first international exposition was held at the Crystal Palace, London, in 1851. Soon after, in 1853, a world's fair was opened at the Crystal Palace in New York (which burned down in 1858); and Dublin, Ireland, was the site of an exposition the same year. The first universal French exposition was held in Paris in 1855. An international exposition was given in Haarlem, Holland, in 1861. The Belgians opened a similar enterprise at Brussels in the same year, and Great Britain in 1862. The Paris Universal Exposition opened on the Champ de Mars in 1867, and was followed by the International Exposition at Vienna in 1873. The Centennial Exposition in Philadelphia, Pa., in 1876, commemorated the signing of the Declaration of Independence. France held the Universal Exposition at Paris in 1889, featuring the famous Eiffel Tower (*q.v.*). International expositions were held at Paris (1900), Glasgow (1901), Brussels (1910), Turin (1911), and Ghent (1913).

In the U.S., the World's Columbian Exposition was held at Chicago, Ill., in 1893, to commemorate the 400th anniversary of the discovery of America. The attendance was estimated at 28,000,000 persons and the cost at \$31,000,000. The Pan-American (1901), at Buffalo; the



GOLDEN GATE INTERNATIONAL EXPOSITION

The "Court of Pacifica" seen above was one of the features of the exposition held on Treasure Island, San Francisco, Calif., in 1939-40

Louisiana Purchase (1904), at St. Louis, with an estimated attendance of 20,000,000 persons; the Lewis and Clark Centennial (1905), at Portland, Ore.; the Jamestown Tercentenary Exposition (1907); the Alaska-Yukon-Pacific (1909), at Seattle; the Panama-Pacific International (1915), at San Francisco, with an estimated attendance of 19,000,000 persons; and the Panama-California (1915), at San Diego, were important expositions.

Between the two World Wars, a number of international expositions were held in Europe and in America. Outstanding examples of these fairs are the Brazilian Exposition, at Rio de Janeiro (1922-23); the British Empire Exposition (1924-25), at Wembley; the Sesquicentennial (1926), at Philadelphia; the International Colonial and Overseas Exposition (1931), at Paris; the Century of Progress Exposition (1933-34), at Chicago; the New York World's Fair (1939-40), at Flushing, New York City; and the Golden Gate International Exposition (1939), at San Francisco.

The post-World War II era, although it took some time for international conditions to return to normal, has been crowded with international trade fairs. To coordinate efforts of American exhibitors, the U.S. government established (in

NEW YORK WORLD'S FAIR, 1964-65

An artist's conception of the Astral Fountain, spouting a 70-ft. column of water within a rotating sphere

UPI Photo



the Dept. of Commerce) an Office of International Trade Fairs; and in 1957 alone the U.S. participated in more than 20 international expositions (e.g., at Paris, Poznań, and Zagreb). Most famous of the international gatherings in this period were the 350th Anniversary Festival (1957), at Jamestown, Va., and the World's Fair (1958), at Brussels. See also *Fair*.

Ex Post Facto (*ĕks' pōst fāk'tō*), a law which is retroactive and makes an act criminal that was not criminal when committed, or increases the severity of the punishment attached to the crime when it was committed. The U.S. Constitution forbids passage of such laws.

Exposure Meter (*ĕks-pō'zhûr mē'tēr*), in photography, a mechanical device for measuring the intensity of light and registering it on a scale, from which may be determined the correct shutter speed and lens aperture, so that correct exposures may be made for pictures taken in a given light. Modern exposure meters usually contain some form of photoelectric cell.

Express (*ĕks-prēs'*), a system of rapid conveyance and safe delivery of messages, merchandise, and parcels. The express business of the U.S. is the outgrowth of the custom under which stage-coach drivers, railroad conductors, and others were entrusted with parcels for delivery and was formally organized by William F. Harneden (1813-45), of Boston, in 1839. In 1849 Adams Express Co. (for illustration, see *Advertising*) was established; in 1852, Wells, Fargo & Co.; and in 1855, the American-European Co. The express business is carried on by the express companies under contract with the railroad companies. In 1917 the American lines were merged into the American Railway Express, later known as Railway Express.

In most European countries, the carrying service is performed by the post office system under the direction of the government, though in Great Britain the railroad companies themselves handle this branch of business on all lines where the parcel post has not been established. Express money orders are payable in most civilized countries.

Expressionism (*ĕks-prēsh'ūn-iz'm*), a term used in the arts, especially in painting and sculpture, to describe many of the artistic movements which originated after World War I and which flourished after impressionism (*q.v.*). Expressionism indicates the work of artists who strive to express strong, subjective emotions—by vigorous application of colors, often in crude combinations, by contrasted and contorted movements, or in any other exaggerated way. The movement found a stronghold in Germany, where artists formed such groups as "Blauer Reiter" (Blue Rider) and "Die Brücke" (The Bridge), but it gathered followers all over Europe and in America. In its widest sense, the term

embraces also the artistic forms of cubism, futurism, and surrealism (*qq.v.*).

Most noteworthy among the expressionists are the painters Marc Chagall, Erich Heckel, Ernst Ludwig Kirchner, Oskar Kokoschka, Franz Marc, Amedeo Modigliani, Emil Nolde, Pablo Picasso, Georges Rouault, and Max Weber, and the sculptors Alexander Archipenko, Ernst Barlach, and Wilhelm Lehmbruck (*qq.v.*).

Extension (*ĕks-tēn'shūn*), in physics, that property by virtue of which matter occupies space and possesses volume. On a macroscopic scale, extension has a definite meaning, in that the exact size of a body can be measured. Protons, neutrons, electrons, mesons, and other elementary particles are extended bodies, but, owing to their quantum mechanical nature, their precise boundaries cannot be specified.

Exterritoriality (*ĕks-tēr-i-tō-rī-āl'i-tē*), or EXTRITERRITORIALITY, a concept of international law, which means the exception of particular persons (e.g., diplomats) from the proposition that everyone within the borders of a country is accountable to the laws and courts of that country. If a diplomat commits an offense against the laws of the nation to which he has been sent, he cannot be tried for such violation, but the country to which he is accredited may request the government of his own country to recall him.

In certain Oriental countries, extrterritoriality was granted by treaty to the nationals of contracting Western nations who were resident therein. Western settlements in the Orient were subject to the provisions of the treaties by which they were founded. The ships of one nation are not subject to the laws of other nations into whose waters they sail. An army in a foreign country is not amenable to the laws of such country except by agreement; otherwise, it is responsible to its own military law. For example, the American Expeditionary Forces (*q.v.*) of World War I re-

EXPRESSIONISM

"Avignon." Painting by the Austrian expressionist, Oskar Kokoschka (1886-)



maintained under American military law, rather than French law. More recently, the U.S. status-of-forces agreements with friendly nations give foreign governments the right to place on trial any member of the U.S. military who has transgressed the law outside of U.S. bases.

Extortion (*ěks-tór'shūn*), or BLACKMAIL, an act or practice of obtaining anything from a person by the illegal use of fear, whether by force, threats, or any other undue exercise of power. The offense of extortion is generally a misdemeanor. To constitute extortion at common law, money or some other thing of value must have been received, and a mere agreement to pay is insufficient. In extortion the taking of property is with the consent of the victim, but induced by the illegal use of fear, while in robbery (*q.v.*), the taking is against the will by means of force.

Extradition (*ěks-trā-dīsh'ūn*), the right to demand the delivery of a fugitive from justice from one state or nation to another. In the absence of treaties it is not the duty of a nation to turn over a fugitive criminal to the state from which he has fled, a position maintained both in England and the U.S.; hence extradition between nations is based upon treaties. However, extradition between the states or provinces of a particular country is usually regulated by the constitutional or national law. This is provided for by the Constitution of the U.S. (Article IV), which requires that "a person charged in any State with treason, felony, or other crime who shall flee from justice and be found in another State, shall, on demand of the executive authority of the State from which he fled, be delivered up to and be removed to the State having jurisdiction of the crime."

The Jay Treaty of 1794 was the first treaty of the U.S. to provide for extradition, but it was not carried into effect by an act of Congress. The Treaty of 1842 was the first to provide for extradition between Great Britain and the U.S. It is the general rule that a criminal who has been extradited for a particular offense cannot be tried on another charge. This question arose in 1875, when the U.S. procured the extradition of a criminal who had committed an offense not mentioned in the treaty, being extradited on one and then tried on another, and against this Great Britain protested. Extradition treaties are in force among all the leading nations.

Extravasation (*ěks-trāv-a-sā'shōn*), in medicine, term signifying the outflow of fluids from the living body, most often used in connection with blood. In cases of extravasation, the vessel or vein containing the fluid is injured; *exudation* is effusion of fluid by filtration through the walls of the respective vessels without causing damage to them.

Extremes (*ěks-trēmz*), a term in mathematics. See *Proportion*.

Extrovert (*ěks'trô-vûrt*), a psychological term

characterizing a person who is primarily interested in, and finds pleasure in, external things. Such a person will not only be able to perceive such external sensations as visual impressions or sounds more clearly and keenly than his counterpart, the introvert (*q.v.*), but he will also observe everything going on around him more eagerly. He will be active, able and inclined to express himself, to tell other people about himself. While this type has been defined by many psychologists, modern psychoanalysis (*q.v.*) has especially emphasized that his libido (*q.v.*) will also be definitely turned outward.

The man of action, the go-getter, are of course characteristic and extreme types of extroverts. The emotions of the extrovert are generally not as deep as those of the introvert since they find their expression more immediately in outward actions. Thus, they leave less of an imprint upon the nucleus of the personality than the emotions of the introvert.

Although being an extrovert or an introvert is largely an inborn quality, conditions and circumstances may develop an individual in one direction or the other or, at least, help or counteract the inborn disposition. Happy social and economic circumstances, freedom in youth, advantageous personal appearance and any form of success develop tendencies toward extroversion, ranging from a fortunate ability to express oneself in word, gesture, and action, to vanity. The public speaker, the opera singer and the actor represent types where the urge of extroversion has defined the vocation. Essentially, even the teacher must be an extrovert in order to be really able to communicate with his students.

Eyck (*ěk*), HUBERT and JAN VAN, the greatest Flemish painters of the 15th century who actually introduced the modern era in painting. The date and place of their birth are uncertain, though it is thought they were born at Maas Eyck and that they resided chiefly at Bruges and Ghent. The date of Hubert's birth is about 1370. His death occurred at Ghent in 1426. Jan was born about 1385 and died at Bruges in 1440. These two painters are distinguished largely because they are the reputed inventors of oil painting and the founders of a Flemish school. Their most famous work is the so-called Ghent Altarpiece, which is now being restored with all its various parts to the Cathedral of Ghent. This altar, finished around 1430, and the work of both brothers, has as its main topic the Adoration of the Lamb. In connection with this theme we find the first portraits of sponsors in a painting of the Northern school, the first landscape, and the first nudes, Adam and Eve. A similar artistic mastery of color and form is found in each of the works of the brothers. Among the main works, of which the majority is Jan van Eyck's painting alone, are the

double portrait of "Jean Arnolfini and His Wife" (1434), London National Gallery; "Madonna of the Chancellor Rolin," Louvre, Paris; "Madonna with Child," National Gallery, Washington, D.C.;



Courtesy Metropolitan Museum of Art, N.Y.

**"THE ANNUNCIATION"
PAINTING BY JAN VAN EYCK AND ASSISTANTS**

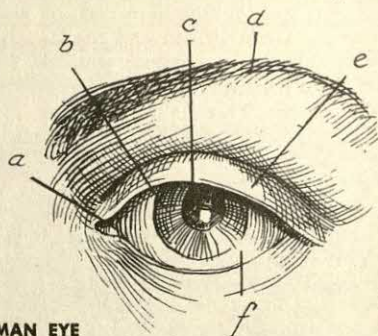
and "Man with the Carnation," Berlin. The work of the Van Eycks combines the qualities of minute attention to detail and realistic observation of nature which was so typical of the Flemish miniaturists from whose tradition they also derived, adding a strong breath of the new time: the counterpart of the Italian Renaissance in the south in both topic and approach.

Eye (*i*), the organ of sight, consisting, in human beings, of a globe about an inch in diameter, situated in a bony cavity of the skull, and protected by the overhanging brow. It is formed of a tough membrane called the *sclerotic* coat, which gives form to the eye, the transparent, convex part in front forming the *cornea*. A thin, black membrane, termed the *choroid* coat, lines the sclerotic coat, which contains the blood vessels, while its black color serves to prevent the reflection of the rays of light. A very thin and transparent membrane, called the *retina*, is inside the choroid coat and is an expansion of the optic nerve. The anterior and posterior chambers are filled with a liquid, that in the former being a thin, clear liquid called the *aqueous humor*, and that in the latter a thick, jellylike fluid termed the *vitreous humor*. These humors serve to keep the eye distended and in shape. Between the two chambers is the *crystalline lens*, which operates

to bring the rays of light to a focus on the retina and is kept in place by the *ciliary* process. A curtain, called the *iris*, is hung behind the cornea, whose center is a hole called the *pupil*. The several colors observed in the eyes of different persons are merely differences in the pigmentation in the iris, which varies from blue to a dark brown. The rather rare and peculiar colorless effect seen in the eyes of the albino is due to the absence of color cells; the pink tint often seen in them is caused by the blood affecting the appearance of the iris on account of the absence of other coloring matter.

The eye is protected by close-fitting shutters called *eyelids*, and by a padding of fat situated between the eyeball and the walls of the orbit in which it is situated. A mucous membrane lines the inner side of the eyelids, and, by being exceedingly sensitive, aids in protecting the eye from irritating substances. The edges of the lids are lubricated by oil glands situated within the *eyelashes*, which prevent them from adhering to each other. Besides, the lashes guard against dust, while, with the lids, they serve to shield against a blinding light. The mucous membrane and cornea are moistened by a saltish fluid called *tears*, which is secreted by the *lachrymal glands*, two oblong bodies situated immediately above and to the outside of the eyeballs. Several ducts facilitate a flow of tears upon the inner surface at the outer edge of the upper eyelid, thus washing the eye and keeping it clean from dust, the tears passing into a little basin at the inner part of the eye near the nose, called the *lachrymal lake*, from which they are drained into the nose by the *nasal duct*. The lachrymal lake overflows upon the face in disease, old age, and when crying.

The phenomenon of sight is one of intense interest to the student of natural history. It is de-



HUMAN EYE

a Semilunar fold, *b* Iris, *c* Pupil, *d* Eyebrow, *e* Eyelid, *f* Sclerotic coat

pendent upon a theoretical substance called *ether*, which is infinitely more subtle than air and is thought to be a thin gas filling all space. Waves of light are produced in the ether as sound waves

are caused in the atmosphere. The motion waves of ether are produced by a light (for example, a lamplight), pass through the pupil of the eye to the retina, and are carried by the rods and cones through the *optic nerve* to the brain, where the light is seen. The variously shaped rods and cones serving to carry the light are to the eye what bristles, otoliths, and Cortian fibers are to the ear. The optic nerve, which has its root in the brain and enters the eyeball, is itself insensible to light. There are no rods and cones at the point where it enters the eye and this is called the *blind spot*. The rays of light are bent by the convex lens so they meet at a point called the *focus*; a good example of this can be given by the use of a common burning glass, through which the focus point is heated to burning by bending the rays of the sun. When entering the eye, the rays of light are converged similarly by being brought to a focus on the retina, and are influenced somewhat in a like manner by the cornea and the humors of the eye.

Distant objects tend to diverge rays of light less than those near by, and under such conditions the crystalline lens does not need to bend so much as in seeing objects near at hand. This property of adjusting the lens of the eye to far or near vision is called *accommodation*. The ordinary adjustment of the eye muscles when at perfect rest is of such a character that objects at all distances over 20 ft. can be seen clearly. Objects at a smaller distance than 20 ft. away from the eye require that the muscles adjust the lens to a more curved position. In this way it is possible for the eye to see clearly at a distance of about 5 in., while vision is best at about 10 in. from the eye.

The field of view in which a person can clearly recognize objects is confined to a small space immediately in front of the eye, while only indistinct shadows seem to occupy the remainder of space near at hand. In reading not more than two or three words can be seen distinctly, but by rapid and unconscious movements of the eyes side-wise the field of view is greatly enlarged. When the eyes are directed toward an object, the sensation of sight is produced almost instantly, but the image persists about one-tenth of a second. It is due to this property that a lighted stick waved rapidly by the hands appears as a circle of fire. Motion pictures take advantage of it by throwing a succession of pictures of a moving object upon a screen at a particular rate, and thus convey to the spectators the effects of movement without interruption. If two shining lights are waved, they appear as one, and two colors revolved quickly give the effect of a mixture of two. Thus, a yellow and a blue surface placed side by side and revolved quickly before the eye appear as a single green spot. The eye is subject to many illu-

sions, which fact is taken advantage of by exhibitors and in the manufacture of toys and fireworks.

Color blindness (*q.v.*) is due to faulty nerves of the retina, leading to an inability to recognize certain colors. Since locomotive engineers, mariners, and motorists are guided by differently colored signals, this defect is a serious one. The retina becomes exhausted when the eye looks steadily at an object for a long time. It is fatigued by bright-colored objects much more readily than others, and during a state of exhaustion is often confused in the recognition of colors, being made color-blind. The intensity of light has an effect upon the pupil, bright light causing a contraction. This results from a strong light exciting the reflex centers of the optic tubercles and has the effect of contracting the muscles of the iris. In the dark, on the other hand, the pupil is enlarged so as to admit all the light possible. In this way, and by means of the muscles that control the upper and lower lids and the eyebrows, it is possible for the eyes to protect themselves against a light too strong to be admitted, though the contracted muscles become easily tired and pain results. *Far-* and *nearsightedness* are caused by defects in the crystalline lens. If the lens is too convex, the rays are brought to a focus before they reach the retina; if too flat, the retina is reached before coming to a focus. In each case the sight is more or less indistinct. Another common defect is a flattened or elongated shape of the globe of the eye. Farsightedness results when the globe is flattened and nearsightedness when it is elongated. The former is overcome by convex and the latter by concave lenses.

The care of the eyes is an important matter, since the loss of vision is a source of much sorrow. Glasses should be worn when they serve to improve the sight, since straining impaired power results in even greater weakness. Fine print and reading by a dim light are harmful, while the sight is often impaired by reading on cars, for the reason that the lens becomes wearied by striving to adapt itself to continuous variations of distance. Light should never be in front when reading or working, but should come over the left shoulder. Alcohol and tobacco tend to cause dimness of vision by weakening the optic nerve. Röntgen (*q.v.*) discovered a kind of light produced by electricity, in 1895, which penetrates flesh, wood, and other substances. By means of this light it is possible to determine by sight the forms of different organs of the body, to examine the bones in the living body, and to locate many substances foreign to the system. Several valuable discoveries relative to the eye have been made by means of it.

The eyes of fishes, reptiles, birds, and quadrupeds are essentially the same as in man. In insects the eyes are immovable and have a dome

shape. Thousands of smaller eyes like honeycomb make up each of the two eyes. At the bottom of the cavity is a nerve to which each little eye may conduct light by means of a lens. As the scale of animal life descends, there is a marked decrease in the power of vision. For instance, in the leech the nerves of sight end in a spot of dark coloring matter of the skin by means of which it is able to receive some idea of its surroundings. Still lower in the scale we find life forms that are barely able to recognize the difference between light and darkness, while those that live wholly in the dark lose the use of this organ, as, for instance, the fish found in the waters of the Mammoth Cave of Kentucky. See also *Blind; Blindness*.

Eyelids (*īlids*). See *Eye; Lachrymal Glands*.

Eylau (*īlou*), a town in East Prussia, Germany, 22 m. s. of Königsberg on the Pasmar River. It was founded by the Teutonic Order in 1336. In 1807, the town was the scene of an indecisive battle between Napoleon and the allied Prussian and Russian forces under Count Levin Bennigsen (1745-1826). The army under Napoleon consisted of about 80,000 men. The allied forces, though smaller, had more artillery and defeated the French. The town is connected by railway with Königsberg. At the end of World War II, the Russians took Eylau (Feb. 1945), which became part of the Russian zone of occupation. Population, ca. 12,500.

Eyre (*ār*), a lake in Australia, in the state of South Australia. Lying 39 ft. below sea level, it is shallow and salty. Although the area is estimated at 3,700 sq. m., the size varies tremendously; during the dry season most of the water evaporates. Among the streams flowing into Eyre Lake are the Barcoo, the Macumba, and the Warburton, but it has no outlet to the sea. It was named for Edward John Eyre, English explorer in Australia in the 19th century.

Eyre, EDWARD JOHN, explorer, born in Yorkshire, England, in 1815; died Nov. 30, 1901. He emigrated to Australia in 1833, where he explored the south coast. Subsequently he was lieutenant governor of New Zealand and later held a similar position in Jamaica, where he suppressed a negro insurrection with much severity. He returned to England in 1866, where he was prosecuted for murder by a committee of which John Stuart Mill was a member, but was eventually justified for his course of executing the leader of the insurrection.

Eyre, JANE, the principal character in a well-known novel by Charlotte Brontë (*q.v.*), published (1847) under the pseudonym of Currer Bell.

Ezekiel (*ē-zē' kī-ēl*), meaning strength of God, the third of the four greater prophets of Israel, to whom is attributed one of the books of the Old Testament. He was the son of Buzi, a priest, and

was carried captive to Mesopotamia along with Jehoiachin, King of Judah, about 11 years before the destruction of Jerusalem under Zedekiah. There with other Jews he settled on the banks of the Chebar River and began his work as a prophet in 594 B.C. His prophecies are mostly in chronological order and consist of three parts—those relating to the complete overthrow of the Jewish nation on account of increasing unfaithfulness to God, those threatening the surrounding nations with divine punishment, and those pertaining to the future deliverance of the Hebrew nation and the rebuilding of Jerusalem. Ezekiel's death is not recorded, but it is thought his prophetic career extended over a period of 22 years.

Ezekiel, MOSES JACOB, sculptor, born in Richmond, Va., Oct. 28, 1844; died Mar. 27, 1917. He attended the public schools, served during the Civil War in the Confederate army, and in 1869 went to Europe to complete his higher education. At the Acad. of Art in Berlin he studied sculpture, and later established a studio at the Baths of Diocletian in Rome. His works were exhibited in Cincinnati and New York City, and in the art galleries of Berlin and Rome. His "Religious Liberty" is a group modeled for the Jewish Order of the Foreign Covenant and is now in Fairmount Park, Philadelphia. He designed and completed the Jefferson monument in Louisville, Ky. Later he prepared 11 statues of famous artists for the Corcoran Gallery in Washington, and made relief portraits of Longfellow, Liszt, Hohenlohe, Lee, and Farragut. Other works completed by him are: "Judith," "Man and Cupid," "Eve Hearing the Voice," "Apollo and Mercury," and "The Daughters of Eve."

Ezra (*ēz'rá*), Jewish priest, a descendant of Aaron, whose patriotic and priestly services to the Jews are detailed in the book bearing his name. He was a ready scribe in the law of Moses, to which he was passionately attached. An exile in Persia, he so commended himself to the reigning monarch, Artaxerxes, as to obtain from him permission to lead the second expedition of the Jews back to their own land. This enterprise began about 458 B.C. Subsequently he resided in Babylon and still later at Jerusalem, where he endeavored to reimpose more strictly the laws of Moses, forbidding marriages with heathen women and annulling such ties where they had been formed. He introduced into the Jewish literature the square Chaldee characters, in place of the old Hebrew forms that had been customary until then. The place of his death is uncertain. The *Book of Ezra* spans a period of 80 years, from Cyrus in 536 B.C. to Artaxerxes in 456 B.C. Some biblical scholars believe it to be from the pen of Ezra, while others admit a plurality of authors. Both Jews and Christians consider the work part of the Scripture canon.



F (*f*), the sixth letter and fourth consonant of the Latin and English alphabets. It is formed by the passage of breath between the upper front teeth and the lower lip, is classed with V as a labio-dental, and belongs to the class of consonants called *aspirates*. The figure of F corresponds to the *digamma* of the Greek and resembles it closely in power. F, in music, is the fourth note of the natural diatonic scale of C. F major, as a key, has one flat as its signature, namely, B flat. The tone F is called *fā* in Italy, France, and in the English-speaking countries.

Faber (*fā'bēr*), CECILIA BOHN VON. See *Caballero, Fernan*.

Faber (*fā'bēr*), JOHANN LOTHAR, born at Stein, Germany, June 12, 1817; died in 1896. He inherited from his father a small factory at Stein, which he enlarged and gave an international reputation for the manufacture of lead pencils. Later he established offices in Berlin, London, Paris, and New York. He founded extensive mills at Cedar Keys, Fla., where he obtained large quantities of cedar wood for exportation and use in his enterprises. Afterward he enlarged his manufactory by adding to the list of products all sorts of materials for drawing, painting, and writing. A patent of nobility was conferred upon him in 1863 and later he became a counselor of state. A large portion of his fortune was devoted to the establishment of schools and charitable institutions.

Fabian Society (*fā'bī-an fō-çī'e-tū*), an English organization founded in London in 1883 to advance socialism (*q.v.*). Opposed to the Marxian view that a class struggle resulting in revolution is necessary to obtain a socialist state, the society believed in the efficacy of social reform and took its name from Fabius Maximus (*q.v.*), the Roman

general noted for his caution and "delaying" tactics. The Fabians numbered among their outstanding members such intellectuals as George Bernard Shaw (*q.v.*), Sidney Webb (*q.v.*), and Beatrice Webb (*q.v.*). They attempted to disseminate their views on equality of opportunity, nationalization of land and certain industries, through lectures and writing. Many of their views were later taken over by the Labour Party (*q.v.*).

Fabius Maximus (*fā'bī-ūs māk'i-mūs*), a distinguished member of an illustrious patrician family of Rome. The Fabii family established a foothold by undertaking to defend its territory against the Veientes, with whom they had been at war, but in 477 B.C. they were all killed, except one member who had remained at Rome. Through this survivor the family was perpetuated. Fabius Maximus was the most distinguished of the second Fabii family. He served five times as consul and twice as censor, and, after the Roman defeat at Trasimenus, was elected dictator. In the second Punic War he attained eminent success against Hannibal by the Fabian policy of war. This policy consisted of avoiding a direct engagement, harassing the enemy by surprises, annoying them by marches and flank movements, and destroying their foragers and stragglers. While he pursued this policy, Rome assembled her forces and prepared them for greater efficiency in common defense against the enemy. In the fifth consulship Fabius recovered Tarentum, an important position that had long been possessed by Hannibal. His death occurred in 203 B.C.

Fable (*fā'b'l*), a feigned story or tale intended to enforce some moral precept. In modern literature the fable is confined to short stories, either in prose or poetry, in which inanimate things and animals are represented with human interests and

passions. By the novelty and utter impossibility of the representation, the interest of the hearer or reader is excited, and thus its symbolic meaning and moral become apparent him, at least if the fable is well contrived. The ancient fabulists were simple, clear, and earnest, and seem to have sprung up in the East. Among the more celebrated are Bidpai, or Pilpai, and the Arabian Lokman, who lived at the time of King David. Among the Greeks the greatest fabulist is Aesop. Phaedrus, the most celebrated Roman fabulist, cleverly imitated Aesop, but with considerable modification, thus giving force to his writings. In later times Gay among the English, Lessing and Gellert among the Germans, and Krylov among the Russians are celebrated. La Fontaine, a French writer of fable, for delicate sarcasm, sagacity, and felicity of expression, takes high rank.

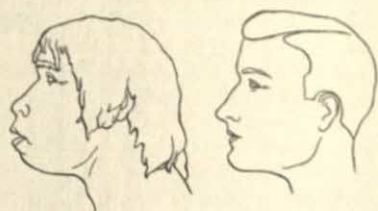
Fabricius (*fă-brish'i-ŭs*), CAIUS, an ancient Roman noted for his characteristic virtue in moderation, fearless integrity, and contempt of riches. He was elected consul in 283 B.C., defeated the Boii and the Etruscans the same year, and was sent on a mission to treat with Pyrrhus the following year. Notwithstanding the fact that he held numerous lucrative offices, he died poor, and the state provided funds for the support of his daughter. In recognition of his military achievements and incorruptible integrity, the senate provided a burial place within the city for him and his descendants.

Façade (*fă-căd*), the exterior face or front of a building. This term is applied chiefly to classic architecture and buildings of some magnitude. The façade contains the principal entrance. The term is used with a qualifying adjective when it refers to other faces of a building, as *court façade*, *rear façade*, and *lateral façade*. Many medieval churches have *false façades*, which are different in outline from the buildings themselves.

Face (*făc*), the front part of the human head, extending from the chin to the line of the hair on the forehead. It includes the nose, eyes, chin, mouth, cheeks, and forehead. The bony foundation is composed of 14 bones, 12 of which occur in pairs. The single bones are the *vomer*, which separates the nostrils, and the bone of the lower jaw, or *inferior maxillary*, which is the only one that is movable. The *superior maxillary*, or upper jaw bone, contains the upper teeth. Two *malar* bones form the cheeks; two *palate* bones, the palate; and two *turbinate* bones, the outer walls of the nostrils. Between the eye socket and the nose are two *lacrimal* bones. The bridge of the nose is formed by two *nasal* bones. All of the bones of the face are irregular in form. Beneath the *frontal* bones, which belong to the cranium, are two deep quadrangular cavities, called the *orbis*, which contain the eyeballs, the tear apparatus, and the protective organs of the eye. In

the depressions and small cavities are located glands, nerves, and blood vessels. Projecting jaws and a receding forehead are prominent features in the face of brutes.

Facial Angle (*fă'shăl äng'g'l*), an angle formed by two imaginary lines—one drawn from the most prominent part of the forehead to a point opposite the incisor teeth; the other from the external ear to the same point, the object being to



FACIAL ANGLES

measure the elevation of the forehead. This angle was made the basis for classifying the races by the Dutch anatomist, Pieter Camper, and is sometimes called *Camper's Angle*. While it has served a useful purpose in ethnology, it is not an infallible criterion of the intellectual capacity of an individual. The general facial angle of anthropoid apes is 40°, of the African Negro 70°, and of the Europeans 80°. Since angles almost as varied can be found in a single large community, the Camper method has been superseded by those of Blumenbach, Cuvier, etc.

Factor (*făk'tēr*), in mathematics, one of two or more quantities which, when multiplied, give a given quantity, or product. When one factor is divided into the product, the quotient is always another factor.

Factory (*făk'tō-rĭ*), a name derived from the word *factor*, meaning "one who makes," hence a place where goods are made.

The term factory has come to be applied to an establishment devoted to the manufacture of various articles of commerce. In this sense it includes the machinery and buildings necessary to such manufacture. The establishment of great factories is comparatively recent and resulted from the invention of useful machinery, the extensive subdivision of labor, and the construction of vast avenues of commerce that facilitate the transportation of manufactured commodities to distant consumers. Material advantages have sprung up from the factory system. They include the increased productiveness resulting from the division of labor; greater mechanical accuracy and a lessening of the cost of production, two results of bringing together different laborers with varied capacity; and the wholesome effects that follow co-operation and co-partnership among the masses of the working men. Trade unions and the vari-

ous forms of organization that have sprung into existence are the direct result of the concentration of laborers in manufacturing centers.

It is probable that the good which springs from the factory system is counterbalanced to a large extent by the curtailment of independent intelligence which follows the minutely subdivided operations resulting from the piece-work of each individual workman.

The factory system as now found in America, both in Canada and the U.S., has made it necessary to regulate by law the manner of managing workshops, mines, and factories. Legislation along this line has been intended to improve the sanitary conditions of all places where large numbers of workmen are employed by making them subject to public inspection, and establishing rigid rules under which vast enterprises may be managed efficiently. Among the primary objects of legislation are the protection of life and health of the workmen, prevention against spreading infectious diseases and vermin by reason of the manufactured product, and protection of the laborers and operators against strikes, disorders, and general disorganization of institutions. Legislation has been directed more commonly with respect to the number of hours the workmen may be employed daily and the improvement of the conditions of factory work. Other objects have been to limit the labor of women and minors and to regulate the manner of and time for which laborers shall receive compensation. Statutory provisions in some cases forbid the employment of minors under certain ages. See *Eight Hour Day*; *Fair Labor Standards Act*; *Labor*.

Faculty (*fāk'ūl-tī*), the term employed to designate collectively the teachers and professors of an institute, college, or university, or the instructors in any department of such an institution, as the faculty of law, of theology, of arts, or of medicine. It is applied collectively to the members of the learned professions, as the faculty of advocates, the medical faculty.

Faculty, in mental science, a natural power of the mind by which it acts uniformly and with facility in some specific way. Some define faculty as a power under the control of the will, having a specific work to do, and as examples enumerate memory, seeing, love, and judgment. Others hold that faculty is a power derived from nature, and differs from ability in that the latter is derived either from circumstances or otherwise.

Fadiman (*fā'di-mān*), CLIFTON, literary critic, author, one of the judges of the Book-of-the-Month Club, born in Brooklyn, N.Y., May 15, 1904. A graduate of Columbia Univ., he was an editor in a book-publishing house (1923-35), book reviewer for the *New Yorker* (1933-43), and master of ceremonies for the radio program "Information Please" (q.v.), the first of many radio

and television assignments. He is a regular contributor to *Holiday Magazine* and since 1959 has been a member of the board of editors of the "Encyclopædia Britannica." The editor of several anthologies and collected works, he has also published volumes of his own writings, including "Party of One" (1955), "Any Number Can Play" (1957), and "Enter, Conversing" (1962).

Faerie Queene (*fār'ē kwēn*), title of a famous poem by Edmund Spenser (1552-99). Of the 12 books planned, only six are extant (I-III, 1590, and IV-VI, 1596); fragments of the later books (1611) have also come down to us. The work narrates the story of a knight representing various virtues, such as courtesy, friendship, chastity, justice, temperance, etc.; the whole is built up as an allegorical romance of medieval chivalry. It may be considered the English counterpart of the Spanish "Don Quixote."

Fahrenheit (*fār'en-hīt*), GABRIEL DANIEL, physicist, born in Danzig, May 14, 1686; died in The Hague, the Netherlands, Sept. 16, 1736. He studied for commercial business but soon abandoned it and entered upon the study of natural philosophy. He traveled extensively, finally settling in Holland, where he took a course in science under Willem Jakob Gravesande and formed friendships with many noted men. In 1714 he discovered that mercury is more satisfactory for use in thermometers than alcohol, which had been employed previously. In devising a thermometric scale, he took as the zero point the temperature of a mixture of ice and salt. The range between this point and the freezing point of water he divided into 32 degrees, and the range between zero and the boiling point of water, into 212 degrees. Fahrenheit was made a fellow of the Royal Society of London in 1724. His thermometric scale is still generally used in Great Britain and the U.S. for all domestic and non-scientific purposes. See also *Thermometer*.

Faïence (*fā-yāns'*), a term used generally for all kinds of glazed earthenware. The name was derived from the French word for the town of Faenza, Italy, which early in the 15th century was an important center for the manufacture of majolica (q.v.), a fine grade of pottery. The pottery soon was being made in most of the countries of Europe, and the term faïence gradually came to be applied to all enameled earthenware.

Fainting (*fānt'ing*), or *SYNCOPE*, a loss of consciousness due to a sudden decrease in the blood supply to the brain. It may be caused by fatigue, prolonged standing, emotional disturbances, pain, nausea, and certain physical disorders. Symptoms of its onset are giddiness, weakness, and sweating. The faint is marked by slowed pulse rate, and a drop in blood pressure. The victim should either sit with his head be-

tween his knees or lie down, if possible with his feet raised. Tight clothing should be loosened. The victim will regain consciousness more quickly if he is given spirits of ammonia to inhale or if cold water is sprinkled on his face. See also *First Aid*.

Fair (*fär*), a market held at regular intervals, at which buyers and sellers gather to transact either a particular or general type of business. A fair can also be an exhibition of products, either in competition with one another or on display for public inspection. See *Exposition*.

Fairbairn (*fär'bärn*), SIR WILLIAM, civil engineer, born in Kelso, Scotland, Feb. 19, 1789; died in Moor Park, Surrey, England, Aug. 18, 1874. With only a rudimentary education and an apprenticeship as a machinist, he began an engineering business in Manchester, England, in 1817. His research and inventions in the use of iron led to important improvements in bridge construction and shipbuilding. From 1835 to 1849 he operated a shipyard in London; in 1845, with Robert Stephenson (*q.v.*), he built the Britannia Bridge across Menai Strait, North Wales, which was notable for its use of unsupported rectangular tubes. Fairbairn was made a baronet in 1869.

Fairbanks (*fär'bängks*), a city in east central Alaska, a port of entry, on a tributary of the Tanana River, 250 m. N.E. of Anchorage. The terminus of the Alaska R.R. and the Alaska Highway, it is the major trade and supply center for the gold-mining, lumbering, and fur-trading region of northern Alaska. The city's chief industries are smelters and sawmills. The Univ. of Alaska is located at College, 3 m. W. of the city. Fairbanks was founded in 1902 when gold was discovered in the area; it was incorporated in 1906. Population, 1960, 13,311.

Fairbanks, CHARLES WARREN, statesman, born near Unionville Center, Ohio, May 11, 1852; died in Indianapolis, Ind., June 4, 1918. He was graduated from Ohio Wesleyan Univ., was admitted to the bar in 1874, and established a law practice in Indianapolis. In 1897 he was elected U.S. Senator as a Republican and the following year served as a member of the British-American joint high commission on Canada. He was re-elected to the Senate in 1903 and in 1904 became Vice President of the U.S. (under Theodore Roosevelt), serving until 1909. In 1916 he was defeated for the Vice Presidency.

Fairbanks, DOUGLAS, actor, born in Denver, Colo., May 23, 1883; died in Santa Monica, Calif., Dec. 11, 1939. His agile and daring performances on both stage and screen won him lasting renown with American audiences. In 1916 he formed his own motion-picture company and starred in such pictures as "The Three Musketeers" (1921), "The Thief of Bagdad" (1924), and "Robin Hood" (1932).

Fairbanks, DOUGLAS (ELTON), JR., actor and producer, born in New York, N.Y., Dec. 7, 1909. The son of Douglas Fairbanks, he made his motion-picture acting debut in 1923, at the age of 13. His first recognition came in "Stella Dallas" (1925). He reached stardom in such films as "A Woman of Affairs" and "Our Modern Maidens" (both 1929). One of his most noted roles was *Peter III* in "Catherine the Great" (1934). At the outbreak of World War II, he worked to aid the cause of the Western allies; he served (1941-46) on active duty in the Naval Reserve. Although he resumed picture work after the war, acting in such films as "Sinbad the Sailor" (1947) and organizing his own production company, he remained active in the cause of world organizations, including CARE and the American Assn. for the U.N. In 1949 Fairbanks moved to England, where he has made several motion pictures and produced films for television.

Fairborn (*fär'börn*), a city in southwestern Ohio, in Greene County, 10 m. N.E. of Dayton. It is on the New York Central and Erie-Lackawanna (freight) R.R.'s. It is in a stock-raising and dairying area, with limestone quarries nearby; cement manufacture is the major industry. The city is in the Dayton standard metropolitan statistical area, and its value added by manufacture in 1958 was \$7,681,000. Wright-Patterson Air Force Base adjoins the city. Fairborn was formed in 1950 by merging the villages of *Fairfield* (founded 1799) and *Osborn* (founded 1854). Population, 1950, 7,847; in 1960, 19,453.

Fairbury (*fär'bër-i*), a city in southeastern Nebraska, seat of Jefferson County, on the Little Blue River, ca. 65 m. S.W. of Lincoln. It is on the Chicago, Rock Island and Pacific and the Union Pacific (freight) R.R.'s. Its industries include meat packing, food processing, and the manufacture of windmills, pumps, pipes and fittings, and concrete and clay products. It was settled ca. 1869. Population, 1960, 5,572.

Fair Deal (*fär dël*), a legislative program proposed by President Harry S. Truman (*q.v.*) in his State of the Union message, January 1949. Among his proposals were expanded civil-rights legislation, compulsory health insurance, Federal aid to education, repeal of the Taft-Hartley Act, and aid to underdeveloped foreign areas ("Point Four" program).

Fair Employment Practices, measures taken by various Presidents of the U.S. to prevent discrimination because of race, creed, color, or national origin on the part of persons doing business with the Federal government. Most recently, the President's Committee on Equal Employment Opportunity was set up, on March 6, 1961; it was formed from the former committees on Government Employment Policy, established in 1955, and on Government Contracts, established in 1953.

The committee is headed by the Vice President of the U.S. (as chairman) and the Secretary of Labor (as vice chairman); it includes as members the heads of major Federal agencies and representative private citizens from business, labor, and religious organizations. The committee deals with both Federal government employment and government contract employment and has some authority to enforce its program, including the power to cancel contracts.

Other governmental committees in this field were the Committee on Fair Employment Practices, established in 1941; a committee within the Office of Emergency Management, set up in 1943 and expiring after World War II; the Fair Employment Board, within the Civil Service Commission, set up in 1948; and the Committee on Government Contract Compliance, established in 1951.

Many states of the U.S. have antidiscrimination statutes as well. See also *Segregation*.

Fairfax (jár'fäks), the name of a family prominent in English and American history. It included FERDINANDO, 2ND BARON FAIRFAX OF CAMERON, born March 29, 1584; died March 14, 1648. During the English Civil War he was in command of the Parliamentary army, 1642-45. His son, THOMAS, 3RD BARON FAIRFAX, born in Denton, England, Jan. 17, 1612; died in Nunappleton, Nov. 12, 1671, at first served in the army under his father. From 1645 to 1650 he was commander in chief of the reorganized, or New Model, Parliamentary army and won several important battles, notably that at Naseby (June 14, 1645). In 1660 he was appointed head commissioner to negotiate the return of Charles II to England. THOMAS, 6TH BARON FAIRFAX, born in Leeds Castle, Kent, England, Oct. 22, 1693; died near Winchester, Va., Dec. 9, 1781. In 1747 he settled in Virginia, where he had inherited more than 5,000,000 acres. He was a friend of George Washington and in 1748 hired Washington to survey some of his property in the Shenandoah Valley.

Fairfield (jár'fjeld), a city in west central California, seat of Solano County, 40 m. s.w. of Sacramento and adjoining Suisun City. It is on the Southern Pacific and the Sacramento Northern (freight) R.R.'s. A trade and processing center for the surrounding agricultural area, it is in the San Francisco-Oakland standard metropolitan statistical area. Travis Air Force Base is nearby. The city, founded in 1859, was incorporated in 1938. Population, 1940, 1,312; in 1960, 14,968.

Fairfield, a town and port of entry in southwestern Connecticut, on Long Island Sound, in Fairfield County, just s.w. of Bridgeport, on the New York, New Haven and Hartford R.R. A seaside resort, it manufactures machinery, hardware, aluminum, chemicals, and explosives. It is

in the Bridgeport standard metropolitan statistical area and in 1958 had a value added by manufacture of \$34,035,000. It is the seat of Fairfield Univ. The town was settled in 1639. Population, 1940, 21,135; in 1960, 46,183.

Fairfield, a city in southeastern Iowa, seat of Jefferson County, 23 m. e. of Ottumwa. It is on the Burlington Route and the Chicago, Rock Island and Pacific R.R.'s. Bituminous-coal mines are nearby, and manufactures include washing machines, farm equipment, wagons, glass, cushions, gloves, and dairy products. It is the seat of Parsons Coll. Settled in 1830, the city was incorporated in 1847. Population, 1960, 8,054.

Fairhaven (jár'hä-ven), a town in southeastern Massachusetts, in Bristol County, on Buzzards Bay at the mouth of the Acushnet River, opposite New Bedford. Fairhaven is a resort and has fisheries and boatyards; it manufactures textiles and small hardware. In the New Bedford standard metropolitan statistical area, it had a value added by manufacture in 1958 of \$4,124,000. The town, settled in 1670 and incorporated in 1812, was an important whaling and shipbuilding center in the 19th century. Population, 1960, 14,339.

Fairies (jár'iz), imaginary beings, often of small size, capable of working good or evil to mankind. They have many different names, such as brownies, gnomes, goblins, pixies, and leprechauns. The word fairy comes from the Latin *fata*, minor Roman deities who controlled the destiny of an individual. See *Fairy Tales*.

Fair Labor Standards Act (jár'lā'bēr stān'-dērdz äkt), also called FEDERAL WAGE AND HOUR LAW, a Federal act which became effective Oct. 24, 1938. The act applies to (1) employees engaged in interstate commerce or in producing goods for such commerce, including those in any process or occupation directly related to such production, and, as a result of the 1961 amendments, to (2) employees in certain large enterprises which are so engaged. The 1961 amendments established a minimum wage of \$1.25 an hour with overtime compensation at not less than one and one-half times the employee's regular rate of pay for all hours worked over 40 in any workweek, to become fully effective on Sept. 3, 1965. Industry committee procedures establish special minimum wages in Puerto Rico, the Virgin Islands, and American Samoa. Exemptions from the act are provided for employees in certain industries and occupations. Provision is made for payment of special lower minimum wages to handicapped workers, learners, apprentices, messengers, and fulltime students, under certain circumstances, upon issuance of special certificates. Employment of homeworkers in certain industries is prohibited.

The act sets a minimum age of 16 for general

employment and 18 for work in occupations declared hazardous by the Secretary of Labor. Children aged 14 and 15 may be employed outside school hours in certain occupations such as office and sales work, as well as in many jobs in food and gasoline service establishments, with limitations as to hours of work.

The act is enforced by the Wage and Hour and Public Contracts divisions of the U.S. Dept. of Labor. The divisions also administer the Walsh-Healey Act, passed in 1936, which applies to government supply contracts over \$10,000. This act provides for payment of not less than the prevailing minimum wage determined by the Secretary of Labor to be applicable to the industry whose products the contractor is furnishing and not less than one and one-half times the employee's basic rate for hours worked over eight a day or 40 a week (whichever is greater). The regular employment of boys under 16 and girls under 18, homeworkers, and prison labor is prohibited, and safety and health standards must be maintained. See also *Eight-Hour Day*.

Fair Lawn (*fär lôn*), a borough in northeastern New Jersey, on the Passaic River, in Bergen County, just N.E. of Paterson, on the Erie-Lackawanna R.R. Although primarily a residential community, it manufactures airplanes, concrete products, and dyes. It is in the Paterson-Clifton-Passaic standard metropolitan statistical area; in 1958 its value added by manufacture was \$51,570,000. It was settled and incorporated in 1924. Population, 1940, 9,017; in 1960, 36,421.

Fairmont (*fär mōnt*), a city in southern Minnesota, seat of Martin County, on the Middle Chain of Lakes, ca. 125 m. S.W. of Minneapolis. It is on the Chicago, Milwaukee, St. Paul and Pacific and the Chicago and North Western (freight) R.R.'s. Besides being a resort, it is a shipping point for the produce of the surrounding region. Industries include food processing and the manufacture of railroad equipment and ribbon. Fairmont was laid out in 1857 and incorporated as a city in 1902. Population, 1940, 6,988; in 1960, 9,745.

Fairmont, a city in northern West Virginia, seat of Marion County, on the Monongahela River, 22 m. N.E. of Clarksburg. It is served by the Baltimore & Ohio and the Monongahela R.R.'s (both freight). It is located in a rich coal area, and mining is the chief industry. Manufactures are coal by-products, mining machinery, aluminum, chemicals, glass, fluorescent tubes, and tobacco products. Fairmont State Coll. is located here. The city was incorporated in 1843. Population, 1940, 23,105; in 1960, 27,477.

Fair Oaks (*fär ôks*), BATTLE OF, an engagement of the Civil War, which took place on May 31, 1862, at Fair Oaks, in Tenrico County, Va., near the Chickahominy River, 6 m. N.E. of Rich-

mond. It was part of the Peninsular Campaign, in which Union troops, under Gen. George B. McClellan, advanced on Richmond, held by Gen. Joseph E. Johnston. On May 31, Gen. McClellan, with 105,000 men, crossed the Chickahominy and was met by ca. 75,000 men, under Gen. Johnston, who attacked McClellan's weak left wing. The Union troops were driven back toward the Chickahominy, and at nightfall the victory seemed to rest with the Confederates. However, the following day, June 1, 1862, the Union troops were reinforced, and the battle continued at Seven Pines, about 1 m. E. of Fair Oaks. The Confederates were repulsed, and Gen. Johnston was wounded. General Robert E. Lee, who took over the command, withdrew his troops to Richmond.

Fairweather (*fär' wēth-ēr*), a mountain on the border between southeastern Alaska and British Columbia, with an elevation of 15,300 ft. Situated at the southwest end of Glacier Bay National Monument, it is one of the peaks of the Fairweather Range.

Fairy Bluebird (*fär'i blō' bûrd*), any of several species of birds of the genus *Irena*; the male is colored in shades of brilliant blue with black markings. A perching bird which nests in trees, it is related to the leafbirds and bulbuls and is found in the tropical parts of Asia, the East Indies, and the Philippines. It eats chiefly fruit, although occasionally insects.

Fairy Ring, a ring of mushrooms (*Marasmius oreades* or other basidiomycetes) which appears in the summer and fall in a grassy area. The mushrooms are produced at the edge of a circle of mycelium which has grown out from an original starting point. The ring increases in size each year. Such rings are common throughout Europe and North America.

Fairy Shrimp, any of several fresh-water crustaceans, in Europe the *Eubranchipus diaphanus*, but in North America usually the *Eubranchipus vernalis*. The latter is about 1 in. long; pinkish and semitransparent, it swims gracefully, always on its back. It lays its eggs in the summer and buries them in the mud. The eggs, which are highly resistant to drying, hatch the following spring.

Fairy Slipper, a swamp orchid (*Calypso bulbosa*) which originated in Eurasia but is widely established in North America. It grows from 2 in. to 8 in. high and is variegated in color—pink, purple, and yellow. Its growing season is from mid-May to early July.

Fairy Tales, folk stories about imaginary supernatural beings capable of performing deeds of magic. Many fairy tales are very old; copies exist of stories from ancient Babylonia, Egypt, and India. Some tales have become widely disseminated among various cultures by wars and migrations over the centuries, and such tales may

have as many as 300 variants. For this reason it is almost always impossible to trace their origins. Folk tales often deal with abstractions such as good and evil, love and hate, birth and death, success and failure. Since primitive people were unable to deal with such concepts in the abstract, they personified them by means of these miniature reflections of human experience.

Although fairy tales deal with the mysteries and superstitions common to all primitive people, the activities of the fairies themselves reflect local occupations and customs. Among rural folk, fairies churn milk and drive horses. Among artisans, they cobble shoes and build houses. Among seafaring folk, they become mermaids or sirens, to comfort or destroy. In the mountains, they are to be found in trees, rocks, and caverns. The humble and poor they elevate; the proud and rich they cast down. During and after World War II they even appeared on the wings and in the cockpits of aircraft as gremlins, where they inspired many remarkable stories which cannot be regarded as anything but true fairy tales.

Folk tales were originally stories for adults, and they were often very cruel in both subject and treatment. Gradually, however, they became recognized as a rich source of entertainment for children. This was true especially after Charles Perrault (*q.v.*) published some of the French versions of the old traditional stories in his "*Contes de ma Mère l'Oye*" ("Tales of Mother Goose," 1697). He retold the tales in a simple and charming style. His book was first translated into English in 1729, and most of the stories have since become classics in English (see also *Mother Goose*).

Most of the fairy tales of Hans Christian Andersen (*q.v.*) are probably original, though patterned on fairy tales he heard as a child. Those in the collections of Jacob and Wilhelm Grimm (*q.v.*), however, are true folk stories, as are those woven into the epic of the "Odyssey" of Homer (*q.v.*). The dividing line between fairy tales and other types of mythology (*q.v.*) is not a clear one. In fact, their common characteristics can readily be seen in such myths as those of the *Nibelungenlied* (*q.v.*), the giant stories of the Orient, the tales of the one-eyed Cyclops of Asia Minor, and the vast mythological structures of the Greek and Roman gods. Some of the best-known fairy tales are those of "The Sleeping Beauty," "Snow White," "Rapunzel," "Cinderella," "The Shoemaker and the Elves," and "Jack and the Bean Stalk." See also color plates, *Sleeping Beauty*; *Cinderella*; *Jack and the Bean Stalk*; *Rapunzel's Golden Ladder*, Volume I.

Faisal II (*fī'sāl*), king of Iraq, born in Bagdad, Iraq, May 2, 1935; died in Bagdad, July 14, 1958. Upon the death of his father, Ghazi I, in 1939, he succeeded to the throne; the kingdom was

under a regency headed by his uncle, Abdul Illah, until 1953. Early in 1958 Faisal headed the Arab Federation uniting Iraq and Jordan (*qq.v.*), but a few months later he was assassinated during a military *coup d'état*.

Faites Votre Jeu (*fât vôt'r jû*), a French phrase meaning "make your play," used by the croupier in the games of roulette and hazard.

Faithfull (*fāth'f'l*), EMILY, philanthropist, born in Headley, England, in 1835; died in Manchester, May 31, 1895. She early became an advocate of the right of women to remunerative employment and *ca.* 1860 established a printing house in London for women compositors. In 1863 she founded the *Victoria Magazine*, which advocated wider recognition of women in public affairs. She lectured in the U.S. and Canada, as well as in England, on the need for improved working conditions for women. Her books include "Three Visits to America" (1884).

Faizabad (*fīz'ā-bād*). See *Fyzabad*.

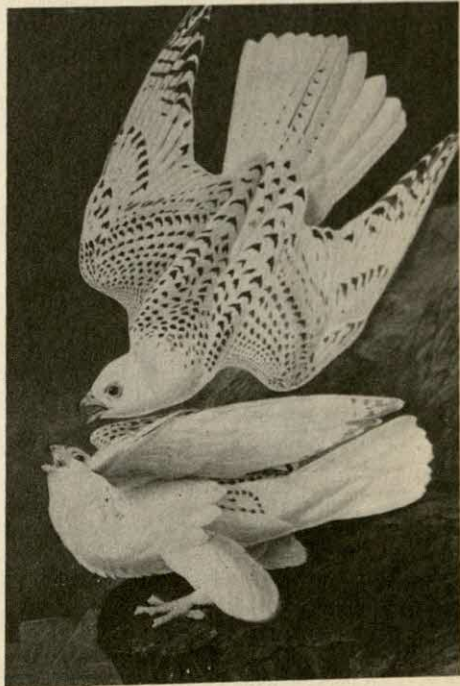
Fakir (*fāk'ēr*), a term used to describe monks or wandering beggars in India who earn their living by performing magic tricks and acrobatic feats and by begging. The term originally applied only to Moslem monks who took a vow of poverty.

Falange (*fāl'ānj*), a political party of Spain and since 1942 the only party permitted by the

GYRFALCON

Water color by John James Audubon (1780-1851)

Courtesy N. Y. Historical Society



government. Founded in 1933 by José Antonio Primo de Rivera, son of Miguel Primo de Rivera (*q.v.*), on Fascist principles, it sided with the insurgents in the Spanish Civil War (1936-39) and after the war became the most powerful political party in Spain. In 1942 Generalissimo Francisco Franco (*q.v.*) made the party's laws the basis of his totalitarian-type government. See also *Spain*.

Falcon (*fál'kún*), the name of a number of species of long-winged birds of prey found in many parts of the world. In falconry only the female is used, principally the European peregrine or Arctic gyrfalcon. Species of the falcon found in the U.S. include the duck hawk, pigeon hawk, sparrow hawk, and prairie falcon. The merlin and kestrel are species of the falcon found in England. The falcon is able to fly at great speed. The beak is strong and short-hooked at the point, the upper mandible having a notch or tooth on its cutting edge. In all species the legs are heavy and stout, the claws are sharp and long, and the wings are powerful. The average length of falcons is about 2 ft. The peregrine is most commonly used in falconry and is exceedingly swift, its speed reaching 65 m.p.h. For picture, see preceding page.

Falconry (*fá'k'n-ry*), or **HAWKING**, the pursuit of game by means of falcons or hawks. In ancient times the sport was called hawking, when the hawk was employed, but later the peregrine and other falcons became popular. The history of this pastime has been traced back to a period before the Christian era. At one time, in Germany,

even kings and nobles devoted the greater portion of the hunting season to it. After the Norman Conquest, England developed the sport until the rank of the individual was indicated by the particular species of hawk carried on his gloved hand or wrist. Later it went largely out of fashion, but at present an attempt is being made to restore this sport, which is attended with growing success. The training of hawks is a mat-

ter requiring much care and patience. They are usually taken while young and hooded with a piece of leather, leaving an aperture for the beak, and are trained to sit on the hand and to eat from the lure. The lure is a device made of a piece of wood or leather covered with the wings and feathers of a bird and attached to a cord, to which a piece of meat is fastened. The falconer swings the baited lure round and round his head, accompanying the action by some call. When the falcon has been taught to obey the lure, it is trained to catch live birds, and soon learns to seize the game. The hood is kept on the falcon during hunting excursions, until the bird is wanted to fly.

Falkland Islands (*fá'k'land*), a group of islands belonging to Great Britain, situated in the South Atlantic Ocean, about 295 m. E. of the Strait of Magellan. The total number of islands is about 100, with an area of 6,490 sq. m., of which the two larger are East Falkland and West Falkland, extending, respectively, 3,000 and 2,300 sq. m. The surface is hilly, with bogs extending from various points on the shore toward the interior region. Forest trees are entirely absent, but many grasses abound, on which herds of cattle and sheep are reared with much success, this constituting the principal industry. Many penguins and other sea fowls are native to the islands. The fisheries are valuable. The climate is healthful and well adapted to the production of cereals found in temperate climates.

The Falkland Islands were discovered by John Davis (1550-1605), Aug. 14, 1592, and were named by Capt. Strong, while cruising in 1689, in honor of Lord Falkland. Stanley, on East Falkland with a population of 1,135, is the capital. Population, 1959, 2,200.

Fall (*fál*), ALBERT BACON, politician, born in Frankfort, Ky., Nov. 26, 1861; died in El Paso, Texas, Nov. 30, 1944. He practiced law and held positions in the territorial government of New Mexico. When New Mexico became a state, he was elected a U.S. senator (1912) and later re-elected. He was Secretary of the Interior (1921-23) under President Warren G. Harding. Fall was brought to trial on a charge of conspiring to defraud the U.S. government in connection with the Wyoming oil scandals (see *Teapot Dome*). The case was dismissed (1929), but Fall was found guilty of accepting a \$100,000 bribe, and he served a one-year sentence (1931-32).

Falla (*fá'lyá*), MANUEL DE, composer, born in Cadiz, Spain, Nov. 23, 1876; died in Buenos Aires, Argentina, Nov. 14, 1946. A pupil of the Spanish musicologist and composer Felipe Pedrell (1841-1922), he was influenced by Claude Debussy and Maurice Ravel (*qq.v.*) and the folk music of Andalusia. His ballet "Love, the Magician" (1915) was based on the folklore of the Andalusians.



HOODED FALCON

Ready for use

lusan gypsies; and much of his music was developed from his research into early Spanish folk music, e.g., the ballet "The Three-cornered Hat" (1919). He also composed for the piano and orchestra; among his best-known works is "Nights in the Gardens of Spain" (1909-15).

Fallacy (*fāl'q-sī*), in logic, an argument or mode of reasoning which appears to be conclusive when in fact it is not. There are indefinitely many kinds of fallacious reasoning, and no complete enumeration of them has been ever made. However, it is possible to classify them into a smaller number of types, although there is no universal agreement concerning any one mode of classification as being the best. Many writers divide fallacies into five classes: formal fallacies, verbal fallacies, material fallacies, sophisms, and abuses of scientific method.

A *formal fallacy* is an argument which fails to conform to the rules of valid inference (or reasoning which draws the necessary consequences from assumed premises). Anyone who reasons that since "all mammals suckle their young" and "no spiders are mammals," therefore "no spiders suckle their young," is arguing fallaciously—even though the premises as well as the alleged conclusion of the argument happen to be true. The fallacy lies in supposing that the conclusion follows logically from the premises, although in fact it does not. More generally, one is committing a formal fallacy when one supposes that an argument is valid simply because the premises and conclusions are true, or when one supposes that the conclusion of an argument is false simply because the premises are false.

A *verbal fallacy* is an argument which, though it appears to be in conformity with the rules of valid inference, involves the use of ambiguous language which vitiates the reasoning. Anyone who reasons that since "war times are prosperous times" and "prosperous times are highly desirable," therefore "war times are highly desirable," is guilty of a verbal fallacy. For the sense in which times of war are said to be prosperous is not the sense in which prosperity is said to be desirable.

A *material fallacy* is an argument in which either a conclusion is obtained from assumptions that are the very ones under dispute, or a conclusion (that is, the final statement drawn from the premises) is asserted which is not the one that is claimed to have been established. To conclude, for example, that the Koran is infallible because it was composed by God's prophet, begs the very question at issue if the assumption that the Koran was written by God's prophet can be established only on the authority of the Koran.

A *sophism* is an argument that apparently wins its point only by introducing irrelevant considerations or by a tacit appeal to the prejudices of the disputants. In some cases, though not in all,

such arguments are deliberately designed to deceive. Indeed, the name "sophism" is derived from the practices of some of the ancient Greek Sophists, who on occasions used language to make the worse appear the better reason. A typical form of sophistry is to dismiss a man's views by ridiculing them, or by so misinterpreting them that he appears to affirm something which he also denies.

An *abuse of scientific method* is an argument that fails to observe distinctions which must be recognized if scientific methods are to be successfully used. A common example of such abuse is the failure to distinguish between the temporal order in which knowledge is acquired and the reasons or evidence which support such knowledge. One is guilty of such confusion when one denies the truth of a statement on the ground that the person who is asserting it has arrived at it by a constant use of drugs. A similar confusion is made when it is supposed that, because we can arrange types of societies into an order of increasing complexity, the historical evolution of societies has been from the simple to the complex.

Fallières (*fā-l'yār'*), CLÉMENT ARMAND, president of France, born in Mézin, France, Nov. 6, 1841; died there, June 22, 1931. He studied in his native town and for a while took up the practice of law but then went into politics. A member of the chamber of deputies after 1876 and of the senate after 1890, he held posts in various cabinets and was elected president of the senate in 1899. He served as president of France from 1906 to 1913.

Falling Bodies. See *Gravitation*.

Fall of Man, phrase applied to the story of Adam and Eve in the Old Testament (Genesis 3). Through their disobedience they lost their innocence and thus brought sin into the world.

Fallopius (*fā-lō'pī-ūs*), GABRIEL, Latin form of GABRIELLO FALLOPIO or FALLOPIA, anatomist, born in Modena, Italy, in 1523; died in Padua, Oct. 9, 1562. He studied medicine at Ferrara and became a teacher in that city. Later (*ca.* 1548) he became a professor at the Univ. of Pisa and then (1551) at the Univ. of Padua, where he taught anatomy, surgery, and botany. At Padua he worked with the Belgian anatomist Andreas Vesalius (1514-64).

Fallopius was a bold thinker, a typical scholar of the age of the Renaissance when the restrictions of medievalism were being broken by the surge of interest in new knowledge. He added much to what was known about human anatomy, especially that of the head and ear. He discovered the chorda tympani, the trigeminal, auditory, and glossopharyngeal nerves, and the sphenoid sinus; he named the hard and soft palates and the muscles of the forehead, occiput, and tongue, and also the vagina and the placenta. He was the first to describe the bones and vessels of the fetus. The



New York Zoological Society Photo

FALLOW DEER

Fallopian tubes, which lead from the ovaries to the uterus in females and which he described, were named for him (see also *Birth*). Among his books, the best known is "*Observationes Anatomicae*" (1561); his complete works, in three volumes, were published in Venice in 1584.

Fallow Deer (*fāl'ō*), a species of deer native to Europe and Northern Africa. In a wild state it is found chiefly in the mountainous regions of the southern part of Europe, but it is very common in the parks and forest reservations. The male or buck has palmated antlers, about 25 in. long, and is somewhat larger than the female or doe, which is without horns. It has a brownish color, characterized by pale spots, and the hair is smooth and fine. The young fawn is mottled and accompanies the mother at an early age. Fallow deer go in herds under a master, an old buck, who keeps an outlook for danger and appears to command the herd. The flesh is highly esteemed for food.

Fallow Land, the name applied to ground which is left untilled in crops but is plowed in the summer, as a means to regain productiveness after continuous cultivation. Such plowing is usually called summer fallow. All land, no matter how productive, if used continually for a number of seasons becomes partly exhausted, and this method is employed to allow it to rest and recover its fertility. In other instances various forms of fertilizing are used for the same purpose. Strictly speaking, the land should remain idle the entire year, but the term is likewise applied to various modes of treatment, such as plowing the ground immediately after the removal of a spring crop, known as bastard fallow; or planting the ground with some crop that can be planted in rows, as corn or potatoes, which admits of the intermediate spaces being cleaned, stirred, and pulverized during the growth. The latter is known as green-crop fallow.

Fallows (*fāl'ōz*), SAMUEL, clergyman and educator, born in Pendleton, England, Dec. 13, 1835;

FALL RIVER

died in Chicago, Ill., Sept. 5, 1922. When 13 years of age, he was brought to the U.S. He was graduated from the Univ. of Wisconsin in 1859 and then served (1859-61) as vice president and principal of Galesville (Wis.) Univ. The Methodist Church ordained him as a minister in 1861. He served in the Union army as a chaplain, 1862-63; in 1864 he commanded the 40th Wisconsin Infantry and, in 1865, the 49th Wisconsin Infantry. Because of his persistent courage, he became known as the "fighting parson"; by 1865 he had attained the rank of brevet brigadier general. Shortly after the war he accepted a pastorate in Milwaukee. He was a regent of the Univ. of Wisconsin, 1866-74, and state superintendent of public instruction of Wisconsin, 1871-74. For a brief time (1874-75) he was president of Illinois Wesleyan Univ. and in 1875 became rector of St. Paul's Reformed Episcopal Church in Chicago, a post he held until his death. In 1876 he was elected a bishop. For many years, Fallows worked in behalf of humanitarian movements; he was interested in prison reform, serving for 21 years on the board of managers of the Illinois State Reformatory, and several times helped to settle serious labor disputes. He founded the People's Inst. on Chicago's West Side.

He published more than 16 books, including "The Bible Looking Glass" (1898), "Story of the American Flag" (1903), and dictionaries and compilations such as the "Complete Dictionary of Synonyms and Antonyms" (1925).

Fall River (*fāl rīv'ēr*), a city and port of entry in southeastern Massachusetts, seat (with New Bedford and Taunton) of Bristol County, on Fall River and Mt. Hope Bay, at the mouth of the Taunton River, ca. 15 m. s.e. of Providence, R.I. It is served by the New York, New Haven and Hartford R.R. (freight). Its principal manufacture is cotton textiles; other products are cloth-rubber, plastics, paper and metal products, and gas ranges. There is a good harbor, by means of which textiles and clothing are shipped out and oil, rubber, and mill supplies enter. Fall River, with part of Bristol County and part of Newport County, R.I., forms the Fall River standard metropolitan statistical area (144 sq. m.; pop., 1960, 138,156), with a value added by manufacture in 1958 of \$112,722,000; the figure for the city alone was \$109,455,000. Bradford Durfee Coll. of Technology and the Cathedral of St. Mary of the Assumption (Roman Catholic) are located in the city.

Fall River was settled in 1656 and separated from Freetown and incorporated as a town in 1803. From 1804 to 1834 it was called Troy. It was incorporated as a city in 1854. The first cotton mill was built here in 1811, and the city became a leading center for the cotton-spinning industry because of its ample water power, moist cli-

mate, good harbor, and available capital. It continued to flourish until the 1920's, when the cotton-milling industry began to move to the South. Population, 1920, 120,485; in 1940, 115,428; in 1960, 99,942.

False Imprisonment (*fals im-prīz'n-mēnt*), the unlawful restraint of one's liberty by detention without authority of law. The false imprisonment of a person is a crime, whether the detention is in a prison, police station, or a private house, even if confined without bars or bolts, and a person guilty of the offense is liable to prosecution as well as to reparation to the party injured. However, several exceptions are made, such as detaining a madman or persons who are known to have committed a crime. Other exceptions are those made in favor of parents, guardians, and teachers, who restrain children under their authority within reasonable limits.

False Pretenses (*fals prē-tēns'ēs*), in law, the willful misrepresentation of fact to obtain money or other property of value. Any person who is guilty of obtaining a valuable consideration in this way may be punished by fine or imprisonment or both. However, the pretenses must relate to a fact or state of facts which are represented as existing at the time or already passed. Representation or promises as to what a party will do or what facts will occur in the future, no matter how false or groundless, are not considered misdemeanors. Besides, the party claiming to be defrauded by a false pretense must have relied upon the representations as true.

Falsetto (*fəl-sēt'tō*), in music, the artificial tone of the voice. The voice contains three registers—chest voice, head voice, and a third, which is not natural, and is called falsetto or false voice. It is usually blended, by practice, with the chest voice so as to make no perceivable break.

Falstaff (*fəl'stāf*), SIR JOHN, comic figure introduced into literature by William Shakespeare (*q.v.*). Sketched as cowardly and boastful, he is said to be a satire on Sir John Fastolfe, an English general. Shakespeare twice brought Falstaff to the stage (in "Henry IV" and "The Merry Wives of Windsor"); this figure has frequently been adopted since, notably in opera, *e.g.*, works of Otto Nicolai (1810-49) and Giuseppe Verdi (1813-1901). He represents the English counterpart of "capitano" in the Italian *Commedia dell'Arte* (*q.v.*).

Family Compact (*fām'i-lī eōm'pākt*), the name of an alliance concluded between France and Spain in 1761. It was designed to unite all the branches of the House of Bourbon as a counterpoise to the maritime ascendancy of England. By its terms the American colonies secured the aid of Charles III of Spain, and Pitt proposed to declare war against that country, but he was outvoted and resigned.

Famine (*fām'in*), a widespread and distressing scarcity of food, usually resulting from drought, war, flood, or insects. Tropical climates subject to irregular rainfall are most commonly affected by famines. Defective economic systems, where generalized scarcity exists even outside the stricken area, or inadequate transportation facilities, which make it impossible to import the necessary foodstuffs, may also bring about famine. The general improvement in transportation has reduced the destructiveness of famine in modern times, but has by no means removed it from our civilization.

War and political disorders often bring famine in their wake. The great famine of Russia in 1921-22 has been attributed to deliberate sabotage of the crops by the peasants in protest against the revolutionary reorganization of agriculture. Herbert Hoover (*q.v.*), who had done much to relieve food shortages in Europe during World War I, undertook large-scale relief operations during this crisis. In 1933 the opposition of the Russian peasants to compulsory collectivization of land again produced a man-made famine. The policy of "scorched earth," so often used in wartime to deprive an advancing enemy of the sustenance of the land, has an even more terrible effect upon the remaining population.

Some of the most widespread famines of modern times have been experienced in Asiatic countries, particularly in India and China. The great famine visiting northwestern India in 1837-38 caused 800,000 persons to perish, and the one occurring in Bengal and Orissa in 1865-66 resulted in about 1,000,000 deaths. In 1874 a famine visited Behar, but it was not excessively destructive of human life because the needed supplies were transported rapidly to the afflicted districts; nearly 500,000 died during the great famine in 1877, which visited Bombay, Mysore, and Madras. It is estimated that 9,000,000 persons perished at the time of the great famine in China in 1877-78, while the one in 1888-89, caused by the overflow of the Yellow River, was equally destructive. The Indian famine of 1897 was minimized by active government intervention, but when it struck again in 1899, 1,000,000 people perished despite what was probably the greatest concerted effort at famine relief ever undertaken. In 1943-44 India was again visited by a famine, possibly the worst in its long history of similar disasters. Seizure of crops by German invasion armies in World War II produced numerous famines; notable among these was the Greek famine following the Italo-German occupation of 1941.

Famine conditions in Europe and the Far East turned from bad to worse after the end of World War II and in 1946. Tremendous efforts made by U.N.R.R.A. (*q.v.*) to relieve the sufferings of untold thousands of victims of recent Nazi op-

pression did not procure enough food, clothing, emergency shelters, and medical supplies. A famine board, inaugurated by the Federal government, comprising experts and humane citizens such as Herbert Hoover, urged reduced food consumption by the American people. For the measures taken by the Federal government to assure the rescue of famine-ridden nations see *Agriculture, U.S. Department of*.

Fan (*fān*), an instrument for agitating the air by the movement of an air-resistant surface, especially for cooling the face or causing the movement of air in a room. Devices for cooling the face by agitating the air were in use among the Greeks and Romans, and were introduced into western European countries shortly after the Roman invasion of Gaul and Germany. Those generally used are made of palm leaves, feathers, thin skin, wood, paper, or ivory, and are of various construction. Ventilating fans are propelled by steam or electric power. Those of the latter class have a simple motor with alternating electric currents, a 50-volt transformer current usually being sufficient to propel the fan. These ventilating fans are frequently seen in department stores, offices, and dining rooms, where currents of air are put in motion for the cooling effects. The household electric fan is familiar in a wide variety of sizes. In mining, for winnowing grain, urging combustion, cooling fluids, and other purposes contrivances of flat disks or waves are utilized, which, when propelled by machinery, revolve rapidly and induce strong currents, the force of the current depending upon the velocity at which the fan moves. See *Blowing Machine*.

Fanaticism (*fā-nāt'ī-sīz'm*), the term used to designate intemperate zeal or ferocious enthusiasm. The spirit of fanaticism has frequently characterized political and religious movements, in which advocates of reforms were unduly enthusiastic, and often resorted to radical measures in endeavoring to further their ends.

Fandango (*fān-dān'gō*), a famous dance of the Spanish people, dating from the Moorish occupation of Andalusia, though it is rarely danced, except at theaters and in parties given by the lower classes. It is said to have come into favor on account of the ecclesiastical authorities of Spain threatening to prohibit dancing. Accordingly, two parties were brought before the judges of a court, in which the fandango dance was given, and this resulted in its approval. In this form of dancing the parties never touch each other, but retreat, approach, and pursue each other in varied movements, voluptuousness being indicated by the movements.

Faneuil (*fān'yel*), PETER, merchant, born in New Rochelle, N.Y., in 1700; died Mar. 3, 1743. He was descended from a family of French Huguenots. His parents removed to Boston, where

he became the head of a successful mercantile business. In 1742 he erected a public market at his own cost and gave it to the city. The building was destroyed by fire in 1761, but was rebuilt by public taxation in 1763 and was used as a theater in 1775. At the time of the Revolution the Americans selected it for a meeting place, from which it came to be called *the cradle of liberty*, and those taking part in the meetings were known as *Sons of Liberty*. Faneuil Hall was remodeled in 1805 and one story was added. The main hall is 80 ft. square. Pictures of distinguished Americans decorate its walls.

Fanning (*fān'ing*), EDMUND, soldier, born on Long Island, N.Y., 1737; died in 1818. Leader of a Tory group in the American Revolution, he was graduated from Yale Univ. (1757) and practiced law in North Carolina. Elected to the colonial legislature, he was later expelled by colonists for his administrative abuses. Appointed surveyor general of New York (1774) by the British, he organized the "King's American Regiment" (1777), which he led in several battles in northern New York. Before the war ended, he fled to Nova Scotia, where he became lieutenant governor (1783). He was governor of Prince Edward Island (1786-1805). In 1798, he discovered a group of islands in the South Pacific, which Britain named the Fanning Islands in his honor.

Fan Palm (*fān pām*). See *Palms*.

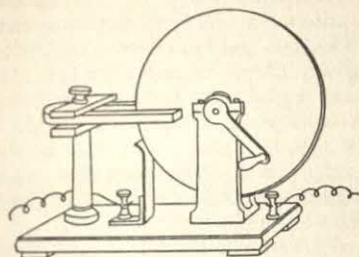
Faraday (*fār'ā-dā*), MICHAEL, chemist and philosopher, born at Newington Butts, near London, England, Sept. 22, 1791; died Aug. 25, 1867. He was the son of a blacksmith, was apprenticed to a bookbinder when 13 years old, and showed an early aptitude for the study of science and electric machinery. When Sir Humphry Davy

MICHAEL FARADAY

Courtesy British Information Services, N. Y.



lectured on chemistry at London, in 1812, he obtained admission, and was soon after appointed assistant at the Royal Inst. He succeeded Davy to the chair of chemistry in 1827, and five years later was created a doctor of civil law. His valuable researches were carefully noted and much



Courtesy Philippine Bureau of Science, Manila

FARADAY'S ORIGINAL DYNAMO

useful information regarding them was afterward published in various works which are still held in high repute. The notable discoveries made by him include new compounds of carbon and chlorine, compounds of carbon and hydrogen, and numerous alloys of steel. In 1829-30 he made a series of experiments in the manufacture of glass for optical purposes. Later he experimented successfully in magnetism and electricity, which resulted in several useful discoveries. Oxford conferred upon him an honorary degree in 1832 and the academy at Berlin, Germany, made him an honorary member. Lord Melbourne granted him a pension of \$1,500 a year, beginning in 1835, and a house at Hampton Court was given him in 1858. Among the most valuable works published by him are: "Lectures on the Forces of Matter," "Researches in Electricity," "Chemical History of the Candle," "Nonmetallic Elements," and "Chemical Manipulation."

Farallones (*fär-räl-lönz'*), an island group off the coast of California, situated 30 m. w. of San Francisco Bay. It belongs to the State of California. The group consists of six islands, on the largest and most southern of which is a lighthouse with a flashing light of the first order, at an elevation of 360 ft. above sea level. Great numbers of gulls and murrees breed on these islands and furnish vast quantities of eggs, which are gathered for the market of San Francisco. Many sea lions and several species of seals frequent the group.

Farce (*färs*). See *Drama*.

Far Eastern Question (*fär ēst'ēr'n*), the problems arising out of the awakening of East Asiatic countries, especially China and Japan, and the participation of non-Asiatic countries in this process. Competition of European states for commercial and political influence in the Orient dates from the time of Prince Henry the Navigator

(1394-1460), when the nations vied with each other in seeking new trade routes. This spirit of competition was intensified in the mid-19th century when China and Japan reluctantly abandoned their policy of seclusion and opened their gates to foreign commerce, although one Chinese port, Canton, had been open to foreign trade since the Ming dynasty (1368-1644). Japan in 1854 granted privileges to American commerce in Japanese waters after an American flotilla under Com. Matthew Perry had arrived at the Bay of Yeddo in the previous year. The treaties of Tientsin and Aigun, concluded in 1858, enabled England, France, and Russia to trade in the interior of China.

The Sino-Japanese War (1894-95) clearly revealed Japan's fast-growing power and China's weakness. China paid a high price for peace, Japan's terms including recognition of the independence of Korea (which Japan annexed in 1910), the cession to Japan of Formosa, and a large indemnity. In addition, the western powers, "with looks of tigerlike voracity, hustled each other in their endeavors to be the first to seize upon Chinese territories" (in the words of the Dowager Empress of China), demanded protectorates, concessions, spheres of influence and other privileges, including that of extraterritoriality, or immunity of foreigners, their places of residence, etc., from Chinese law. Russia received Port Arthur and the Liaotung Peninsula, the gate to Manchuria (1897-98); Germany leased Kiaochow in Shantung for 99 years and received a sphere of influence in the Shantung province and the Yellow River valley (1895-97); France leased (1898-99) the Kwanchow Bay rounding off Indo-China; and England, who half a century before had made Hong Kong another Gibraltar, leased the port of Wei-hai-wei (1898). In addition to these land grants, China acquiesced to manifold railroad, mining, and other concessions. Resentment against this exploitation by foreigners and the inability of the government to resist such demands contributed largely to the overthrow of the Manchu dynasty and the establishment of the Chinese Republic in 1912.

The U.S., following quite a different policy, opposed land grants. Her goal was only to protect American commercial interests. Recognizing in the procedure of the European nations a stumbling block to realization of this aim, the U.S., through John Hay, Secretary of State under McKinley, advocated an "Open Door" policy in China. In answer to Hay's note of Sept. 6, 1899, the major powers agreed to maintain the Chinese customs tariff and levy equal harbor dues and railway rates on the ships and merchandise of all nations. The basically commercial character of this document, however, soon became political. Turning to account the great peril to the



From Wisconsin Magazine of History

COMMODORE PERRY ENTERS TOKYO, 1854

Japanese woodcut

European states of the Boxer (anti-foreign) movement, Hay proclaimed, on July 3, 1900, that the goal of the U.S. was "to preserve Chinese territorial and administrative entity, protect all rights guaranteed to friendly powers by treaty and international law, and safeguard for the world the principle of equal and impartial trade with all parts of the Chinese Empire." The policy which this declaration set forth did not, however, check an Asiatic catastrophe.

The Far Eastern Question took another turn, a serious threat to European interests coming now from an increasingly strong Japan. Japan had signed an alliance with Great Britain (1902, later renewed), according to which the former entered World War I on the side of the Allies, gaining much benefit thereby. She had pledged the independence and integrity of China as late as 1908 (Takahira-Root Agreement), but in 1915 presented to a China torn by internal strife the notorious "Twenty-one Demands." With a few minor exceptions, China was forced to accept them, thus giving Japan control in the government, commercial advantages and further territorial rights. The U.S. recognized (1917) Japan's "special interests" in China (Lansing-Ishii Agreement). The Nine-Power Treaty (1922), designed to disentangle the confusion of the international situation in China and to reach amicable relations with the awakening Chinese Republic, collapsed when Japanese foreign policy came to be openly directed toward the establishment of a "Greater East Asia" under the aegis of the "Rising Sun." During the Sino-Japanese War, which began in Manchuria in 1931, lapsed into minor clashes, and flared into full-fledged warfare in 1937, Japan's animosity against the Western Powers became increasingly obvious. Japan flouted the League of Nations; attempts by the U.S. to settle the differences and to return to recognition of the "Open Door" policy failed as the militarists rapidly gained the upper hand in Japan. Involved in a war with China which had grown to unexpected proportions, Japan pursued a course which led finally to the attack on Pearl Harbor (*q.v.*), Dec. 7, 1941, forcing the U.S. into World War II. After her defeat, Japan moved toward a demo-

FARGO

cratic form of government and an economic boom. India was partitioned, creating the state of Pakistan. The Chinese Communists established a dictatorship over Mainland China, while the Nationalists under Chiang Kai-shek entrenched themselves on Formosa. The Soviet Union's drive for dominance resulted in unrest throughout the area. Viet Nam and Laos were in ferment because of opposing leftist and rightist factions. The two Communist giants, the U.S.S.R. and China, were at ideological odds, vying for the loyalty of the satellite nations. India, traditionally neutral, was driven closer to the West when China undertook open aggression against her, invading a large area of Indian territory.

Farel (*fä-rêl'*), GUILLAUME, religious reformer, born in Gap, France, in 1489; died in Neuchâtel, Switzerland, Sept. 13, 1565. He studied for the ministry at the Univ. of Paris but later became an ardent supporter of the Reformation, which he successfully introduced in Neuchâtel. Settling in Geneva in 1532, he achieved adoption of the Reformation there in 1535. In the following year he persuaded John Calvin (*q.v.*) to join him, and the two undertook active organization of the church. The severity of their reforms, however, resulted in their banishment from the city in 1538, and Farel returned to Neuchâtel, where he became a pastor.

Fargo (*fär'gō*), the largest city in North Dakota, in the southeast, seat of Cass County, on the Red River, 250 m. n.w. of Minneapolis-St. Paul, Minn. It is served by the Northern Pacific and Great Northern R.R.'s. A processing, manufacturing and distribution center for a large agricultural region, Fargo has food and milk processing plants. The city manufactures structural steel and tanks. It is a part of the Fargo-Moorhead, N.D.-Minn. standard metropolitan statistical area, the North Dakota portion of which (pop., 1960, 66,947) includes all of Cass County. Fargo is the seat of North Dakota State Univ., St. Mary's Roman Catholic Cathedral, and Gethsemane Protestant Episcopal Cathedral. Settled in 1871, it was incorporated in 1875. Population, 1950, 38,256; in 1960, 46,662.

Fargo, WILLIAM GEORGE, pioneer expressman, born in Pompey, N.Y., May 20, 1818; died in Buffalo, Aug. 3, 1881. A grocery clerk in his youth, he later entered the express business in Buffalo, forming (1844) with Henry Wells the first firm with shipping routes west of Buffalo. In 1850, through mergers, the firm became the American Express Co., of which Fargo was secretary (1850-68) and president (1868-81). He also founded Wells, Fargo & Co. (1851) to handle express between New York City and San Francisco. He was a director of the Northern Pacific and New York Central R.R.'s, and mayor (1862-66) of Buffalo.

FARIBAULT

Faribault (*fär'i-bô*), a city, the county seat of Rice County, Minn., at the confluence of the Cannon and Straight Rivers, 52 m. s. of St. Paul. It is on the Chicago, Rock Island, and Pacific, the Chicago Great Western, and the Chicago, Milwaukee, St. Paul and Pacific R.R.'s. The surrounding country is fertile and contains many productive farms and dairying establishments. Among the manufactures are woolen goods, machinery, flour, furniture, cheese, and clothing. The city is the site of various institutions including the Shattuck School for boys and St. Mary's School for girls. Faribault was settled in 1835 on the site of a trading post built in 1826 by Alexander Faribault, a French fur trader, and incorporated in 1877. Population, 1950, 16,028.

Farinelli (*fä-rē-nē'l'le*), CARLO, original name CARLO BROSCHI, singer, born in Naples, Italy, Jan. 24, 1705; died in Bologna, July 15, 1782. His voice was developed early in life and showed such a degree of culture that he became a favorite singer among the European monarchs of his time. Philip V bestowed marked honors upon him, granting him special privileges at the court of Spain, as did Ferdinand VI.

Farley (*fär'lē*), JAMES ALOYSIUS, politician, born at Grassy Point, N.Y., May 30, 1888. He began his political career by building up a Democratic organization in Rockland County, N.Y. He served in the New York legislature until 1922, when Gov. Alfred E. Smith appointed him chairman of the N.Y. State Athletic Commission; he served in this position until 1933. From 1933 to 1940 he was Postmaster General of the U.S. He also served as chairman of the Democratic National Committee (1932-40) and chairman of the N.Y. State Democratic Committee (1930-44). He managed the first two Presidential campaigns of Franklin D. Roosevelt (*q.v.*), but later opposed the President in his decision to seek a third term. He became a director of the N.Y. Central R.R. (1940), and also a high executive of the Coca-Cola Co. He published "Jim Farley's Story" in 1948.

Farley, JOHN MURPHY, cardinal, born in New-ton Hamilton, Ireland, April 20, 1842; died Sept. 17, 1918. In 1891 he was appointed vicar-general of the archdiocese of New York, in 1902 became archbishop of New York, and in 1911 was appointed cardinal. His publications include "Life of Cardinal McCloskey" and "Why Church Property Should Not Be Taxed."

Farm Credit Administration (*färm krēd'it äd-mīn-īs-trā'shūn*), a U.S. Federal agency, deriving its authority mainly from the Federal Farm Loan Act of July 17, 1916, and amendments, the Executive Order of March 27, 1933, and the Farm Credit Acts of 1933, 1935, 1953, 1955, and 1956. Farmers obtain long-term farm mortgage loans through about 1,100 national farm loan associa-



JAMES A. FARLEY

Courtesy Coca-Cola Co.

tions and 12 Federal land banks. They borrow for operating purposes from 497 local production credit associations which obtain lending funds from 12 Federal intermediate credit banks. Farmers' marketing, purchasing, and business-service co-operatives borrow from 13 banks for co-operatives. As of Jan. 1, 1957, the Farm Credit System, which is supervised by the administration, had extended loans amounting to \$3,000,000,000.

Farmers' Institute (*fär'mēr's in'stī-tūt*), organizations devoted to the education of farmers, usually by direct instruction. The movement toward this type of education started comparatively early in American history, generally under the sponsorship of local or state agricultural societies. In various forms farmers' institutes now exist throughout the U.S. and Canada. Much of the education formerly carried on by such institutes is now offered by the U.S. Dept. of Agriculture, which co-operates by providing instructional material and by making its researches available to interested groups. In most states agricultural colleges supervise the programs. County governments also participate in the activity. The course of study pursued includes topics relating to improved methods of cultivation, fertilization, care of machinery, stock raising, wool, mutton, and pork production, transportation to market, beautifying of farm life, and many other kindred subjects. It is customary to have experienced professors of agriculture and mechanical arts give a series of lectures in order to bring the practical experience of the central stations in direct contact with those actually engaged in agricultural occupations. In some instances the institutes are in session for several weeks consecutively, while in others local meetings are held at various points in the county or district, thereby achieving a broader coverage of the population.

While farmers have long recognized the value

of the institutes, it is only in recent years that their importance has been noted by the community at large. Increased state appropriations have made possible increased attendance and an ever-growing number of sessions. The institute movement has progressed most successfully in the states of the north and northwest and in Ontario and the western provinces of Canada.

Farmers' Organizations (*ôr-gan-î-zā-shûns*), the societies or parties organized by farmers for the purpose of bettering the condition of agriculturists, and influencing legislation favorable to the various lines of agriculture, horticulture, floriculture, stock raising, and dairying. Among the first organizations of this kind was the Patrons of Husbandry, better known as the National Grange, organized in 1867. This was formed on the plan of fraternal societies, under which certain degrees were given to members. The subordinate lodges or granges organized under the system number about 8,000, the present enrollment being approximately 800,000. Later other organizations were formed, having a more or less political significance, among them the National Agricultural Wheel, the National Farmers' Alliance, and the National Farmers' Political League. Some of the better known of the present farmers' organizations are the American Farm Bureau Federation, the Farmers' Union, and various farm cooperatives (see *Cooperation*). More recently, Farmer-Labor parties have been organized in several States, and have acquired considerable political influence.

Farm Security Administration (*färm sê-kû-rî-tî-âd-mîn-îs-trâ'shûn*), created by executive order of Apr. 30, 1935, under the name of Resettlement Administration. When transferred (1936) to the U.S. Department of Agriculture, the name was changed to Farm Security Administration. Nearly 1,000,000 farm families who lacked other sources of adequate credit have been aided by loans (usually repayable in five years at 5% interest) to purchase machinery, equipment, livestock, seed, feed, fertilizer, and other supplies they needed to make a living. In World War II, loans were primarily made to increase production of essential foods and fibers. The Administration also aids borrower families to get medical and dental care in cooperation with local physicians and dentists and also aids in working out voluntary agreements between farmers and creditors. Housing projects, including "greenbelt" communities and other rural or suburban projects, formerly FSA activities, are now administered by the Federal Public Housing Authority. The Servicemen's Readjustment Act of 1944 made veterans of World War II eligible for loans extended by the agency.

In 1946, Congress made permanent the program of farm-operating credit and individual

guidance for small farmers which had been conducted, on a year-to-year basis, since 1935, and enlarged the farm ownership program created by the Bankhead-Jones Farm Tenant Act. This legislation, approved Aug. 14, created the Farmers Home Administration within the U.S. Department of Agriculture and transferred to the FHA the functions formerly carried on by the Farm Security Administration and the emergency crop and feed loan division of the Farm Credit Association.

Farne Islands (*färn*), or FERN ISLES, a group of islands in the North Sea, off the east coast of England, opposite Northumberland. The group includes 17 islets of rocky formation. Navigation in the vicinity is very dangerous. They were the scene of the heroic deeds of Grace Darling in 1838, when the *Forfarshire* was lost. A tower built to the memory of St. Cuthbert is on one of the islands. They belong to Great Britain.

Farnese (*fär-nä'zā*), noted family of Italy that gave many eminent names to the republic of Florence and to the church. It descended from the early part of the 13th century and several branches of it still remain. Among the famous works of art found at Naples are several associated with the Farnese family, among them "Farnese Hercules," "Farnese Bull," and "Farnese Flora." The name of this family was given to the Farnese Palace at Rome, an edifice erected by Pope Paul III, which was designed by Antonio da Sangallo and completed by Michaelangelo. It was formerly the property of the Farnese family, but afterward passed to the ruling dynasty of Naples.

The most celebrated members of the house were Pietro Luigi, natural son of Pope Paul III, born 1503; died 1547. He built a citadel at Piacenza. Hated for his despotism and debauchery, he was assassinated and his citadel was handed over to the governor of Milan. His grandson, Alessandro Farnese (1545-92), distinguished himself at the Battle of Lepanto, and later became governor of the Spanish Netherlands.

Faroe Islands (*fä'rô*), a group of 25 islands situated in the North Atlantic, between Iceland and the Shetland Islands. The coast lines are largely rugged cliffs, rising abruptly to a height of 500 to 2,000 ft., while the mountains of the interior contain extensive tablelands, none of which exceeds 3,000 ft. above the sea level. These islands belong to Denmark. They are governed by resident representatives appointed under the direction of the king. The inhabitants are descendants of Scandinavian people who settled here largely in the 9th century. Strömö is the largest island and contains the capital, Thorshavn, which has a population of about 1,000. The islands are treeless, but have valuable deposits of peat and coal. Building material and machinery are imported largely from Norway. The chief industries

of the people consist of fishing, hunting, and sheep culture. Only 17 of the islands are inhabited. The religion is exclusively Lutheran. Numerous schools are supported by government grants. During World War II, the islands were occupied by the British in March 1941, though the Danish government retained governmental control. Population, ca. 25,500.

Farouk (*fä-rōōk'*) I, king of Egypt, born in Cairo, Feb. 11, 1920. He succeeded to the throne under a regency, upon the death of his father, Fuad I (1936). When he became of age a year later, he took the constitutional oath as reigning King of Egypt. Many of the important posts were held by members of the Wafdist Party who had operated in opposition to Fuad. Farouk immediately replaced them with his own men and in the first election under his rule (1938), the Wafdists received only minor representation in Parliament. When England entered World War II in 1939, Farouk sent aid but did not declare war on the Axis Powers until 1945. After the conflict, Farouk, in order to ingratiate himself with his people, helped to end the previously amicable Anglo-Egyptian relations. Popular discontent mounted, however, over corruption in government and among members of the court and over the continued stationing of British troops in the Suez area. The climax came on July 23, 1952, when a *coup d'état*, led by a group of young army officers, including Col. Gamal Abdel Nasser, forced Farouk to abdicate (July 26) and to leave the country. He was succeeded by his son, but the monarchy was abolished later in the year.

Farquhar (*fär'kwēr*), GEORGE, dramatist, born in Londonderry, Ireland, 1677; died in 1707. He renounced the acting profession in Ireland

after accidentally killing a fellow-actor. Arriving in London about 1697, he served for several years in the British army. Although he achieved considerable success as a dramatist, he died in poverty.

The plays of Farquhar's first period are in the tradition of Restoration comedy. These include "Love and a Bottle" (1698), "The Constant Couple" (1699), and "Sir Harry Wildair" (1701). During his second period, he experimented with a moralizing type of drama. Examples are "The Inconstant" (1702) and "The Twin-Rivals" (1702). In the same year, "A Discourse Upon Comedy" was published, in which the author maintained that a dramatist, in order to give moral instruction, must be diverting, and that the ideal drama, therefore, is the successful comedy. Whether it observed the classical rules of dramatic structure, he considered to be unimportant.

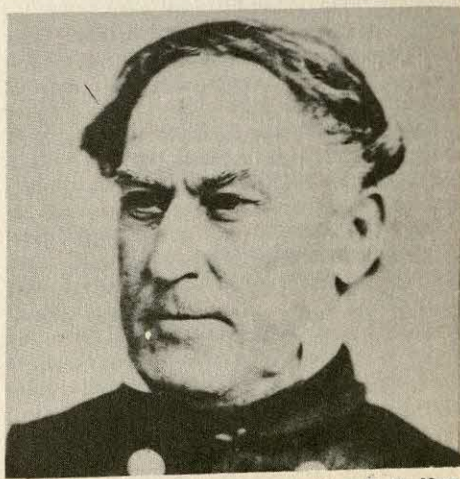
The plays of the third period are "The Recruiting Officer" (1706) and "The Beaux Stratagem" (1707). The latter may be regarded as his masterpiece. Although Farquhar began his career in the witty and impudent tradition of the Restoration, we can see in these latter works that he has made a transition to another school of literature, a school which is characterized by an interest in romantic love, in humorous and healthy morality, and in the bourgeois affairs of the market and the inn. He provides a link between the Restoration period and the sentimentalism and realism of the 18th century.

Farragut (*fär'ä-gūt*), DAVID GLASGOW, naval commander, born near Knoxville, Tenn., July 5, 1801; died in Portsmouth, N.H., Aug. 14, 1870. He entered the navy as midshipman at the age of nine, was promoted to a lieutenantcy in 1821, and in 1851 secured an appointment as assistant inspec-



Courtesy Brown Bros., N. Y.

GEORGE FARQUHAR



Courtesy U. S. Navy

DAVID G. FARRAGUT

FARRAR

tor of ordnance. The long period of peace gave him little opportunity to distinguish himself as an officer, though he received a commission as captain in 1855. At the outbreak of the Civil War he was assigned to accompany an expedition against New Orleans and with it set sail in February 1862. After shelling the city without effect for a week, he succeeded in forcing a passage of the river in the dark on April 25, which caused the city to fall and pass into the hands of the Federals under Gen. Butler. Later Farragut took possession of Baton Rouge and Natchez, ran the batteries at Vicksburg, and joined the Union fleet above. He was made rear admiral on account of his success at New Orleans. On Aug. 5, 1864, he attacked the Confederate fleet in the Bay of Mobile and compelled it to surrender, and thereby closed the port of Mobile by a successful blockade. Farragut directed the contest while lashed to the mast of his flagship, the *Hartford*. In 1866 Congress created him a vice admiral, and two years later raised him to the rank of admiral, a rank that had not existed in the U.S. navy before that time. He is commemorated by bronze statues in Washington and New York.

Farrar (fär'ēr), **FREDERICK WILLIAM**, clergyman, born in Bombay, India, Aug. 7, 1831; died Mar. 22, 1903. He was educated at King's Coll., London, and later became a scholar and fellow of Trinity Coll., Cambridge. While at the latter institution, several university honors were bestowed upon him, among them the chancellor's prize for English verse. In 1854 he became a deacon of the English Church, and was admitted into the priests' order three years later. For five years he held with distinction the head mastership of Marlborough Coll., in 1876 was appointed rector of St. Margaret's, London, and in 1883 became Archdeacon of Westminster. He wrote several excellent works on religious and moral philosophy, the most important being the "Life of Christ," which appeared in many editions and was translated into various languages.

Farrar (fä-rär'), **GERALDINE**, American dramatic soprano, born at Melrose, Mass., 1882. After studying in Boston, New York, Paris, and Berlin (where she was a pupil of Lilli Lehmann), she made her debut in Gounod's "Faust" at the Royal Opera, Berlin (1901), winning immediate acclaim. After some years in Germany, she was welcomed at the Metropolitan Opera House, New York (1906), remaining with this association until 1922. She appeared occasionally in films from 1915 and in light opera from 1925 onward. Her memorable operatic roles included "Madama Butterfly," "Mignon," "Tosca," and "Juliet." Her autobiography, "Geraldine Farrar," appeared in 1916.

Farthing (fär'THing), the smallest coin (in value) of Great Britain, the fourth part of a



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GERALDINE FARRAR

penny. It was first coined by the Saxons, but the copper farthing did not come into use until 1665. Made of bronze since 1860, a farthing is equal to about one-half cent, but it is virtually never used except as money of account in modern Britain.

Farwell (fär'wēl), **CHARLES BENJAMIN**, public man, born in the State of New York, July 21, 1823; died in 1903. He removed to Illinois in 1838, was clerk of Cook County a number of years, and in 1861 joined his brother in establishing a prosperous wholesale dry goods business. In 1870 he was elected to Congress as a Republican and was re-elected in 1872 and in 1874. He succeeded John A. Logan as U.S. senator.

Fascination (fäs'si-nā'shün), any irresistible influence which captures or controls the will or intellect. That human beings are fascinated more or less easily by certain natural influences is admitted on every hand, but some go so far as to seek to revive widespread belief in the evil eye, an influence that the superstitious thought existed, and by which individuals could be compelled to act contrary to their wishes. Some naturalists think that certain snakes and other animals have this power over mice, squirrels, and birds, but it has been neither satisfactorily explained nor demonstrated.

Fascism (fäsh'iz'm), a political, authoritarian movement, which, under the leadership of Benito Mussolini (q.v.), came to power in Italy in 1922. The word is derived from the Italian *fascio*, a bundle of rods with an ax projecting from their midst borne before ancient Roman magistrates as a symbol of authority.

ORIGIN. Benito Mussolini applied this word as early as 1915 to the clubs of the so-called interven-

tionists who demanded Italy's participation in World War I on the side of the Entente (*q.v.*). When peace negotiations (1919) appeared to disfavor Italy, not granting her all the territories promised before her entry into the war, and with the influence of the leftist factions growing, Mussolini founded (in Milan, March 1919) the first *fascio di combattimento*. This party simultaneously instilled in the people dissatisfaction with the Treaty of Versailles and worked against the leftists. The movement gradually gathered momentum. Savage fighting soon ensued between the so-called *squadristi*, a semimilitary Fascist organization, and the leftists. Mussolini, after refusing to join a coalition cabinet, staged the threatening "march on Rome" of his squadrons (Oct. 28, 1922) and received the premiership from the hands of the King.

IDEOLOGY. The original purpose of Fascism was limited to realization of the Italian nationalist war aims. Even in 1922, Mussolini did not have a clear general program. Fascist doctrine, however, soon found characteristic expression in the slogan: "*Crederci, obbedire, combattere*" ("Believe, obey, fight"). The party, mightier even than the state, became identical with its leader, the *Duce*, whose orders were to be followed without criticism. Fascism thus established an authoritarian rule. Fascism is—admittedly—diametrically opposed to the principles of liberalism and democracy. Mussolini soon eradicated all civil liberties, outlawed all political parties except his own, transformed the Fascist system politically and economically into a corporative state by the act called "The Legal Discipline of Collective Labor Relations" (1926; augmented in 1931 by the National Council of Corporations), and abolished universal suffrage (1927). The Fascists suppressed and, in some cases, even murdered (*e.g.*, G. Matteotti) those opposing their rule.

INTERNATIONAL EFFECTS. By the start of the 1930's, Fascism had spread throughout most of the world. Germany's National Socialism had become its most powerful counterpart, but similar movements pervaded Portugal, Rumania, Bulgaria, Poland, Latin America (Chile, Argentina, Brazil), and Japan. Even in England, motherland of the parliamentary system, Fascism had its spokesman in Sir Oswald Mosley. Fascist-minded groups in the U.S. (discounting the German-American Bund), rather insignificant in number, were too widely split by religious differences and by the number of would-be leaders to gain any real importance. In France, after her defeat (June 1940) in World War II, Marshal Henri Philippe Pétain and Pierre Laval clung to Fascist doctrines, which had for several years been propounded by various militant factions in that country.

In Italy, however, after Mussolini was arrested

on July 25, 1943 (during the Italo-German reverses in World War II), a newly formed Italian government attempted to strike out Fascist legislation and institutions. Mussolini, rescued by the Germans from his place of confinement, established a Fascist Republican Government in the part of Italy under German domination, which fell with the final defeat of Germany in May 1945, and Mussolini was captured and executed by Italian partisans. Following World War II Fascist organizations again appeared in various countries although their strength and influence has been considered of no great importance.

Fashion (*fāsh'ūn*), the prevailing style of usages, ornaments, and dress which is adopted by society and accepted by its members in accord with a general law of interest. The fashions change from time to time. They are, in theory, supposed to be formed by the needs of serviceability and by desire for beauty of design. When we examine past fashions, however, we find that the changes were rapid and marked, and that caprice was more often the cause than utilitarian motives. The desire to dress *in fashion*, to have every part of the apparel agree with the accepted style, is noticeable throughout all periods of history. See also *Dress*, and color plates of costumes in Volumes III and IV.

Fashoda (*fā-shō'dā*), a town of the Egyptian Sudan, on the White Nile. It was occupied by the French under Capt. Marchand in 1898, a move opposed by the British; the French evacuated it after receiving commercial concessions in the region of the upper Nile and an approval to the extension of their possessions in the Central Sudan. Fashoda was founded by the government of Egypt in 1867. It lost its importance after 1898 and was renamed Kodok.

Fast (*fāst*), the voluntary abstinence from food, a practice which originated as a religious discipline. It may be either a total abstinence for a brief time from all food, or only from certain kinds, as meat or leavened bread. The origin of the practice is obscure. Among the ancient Egyptians fasting seems to have been associated with many religious festivals, notably that of Isis, but it was not compulsory. Among the Jews fasts were numerous, but the day of atonement was the only fasting day enjoined by the law of Moses. Mishna speaks of four others commemorating, respectively, the storming of Jerusalem by Nebuchadnezzar, the burning of the temple by Titus, the sacking of Jerusalem by Nebuchadnezzar, and the reception of the news of the destruction of Jerusalem by Ezekiel and other captives. Other fasts were proclaimed by royal or other authority on special occasions.

Fasting probably did not at first occupy nearly so prominent a place in Christian rituals as that to which it afterward attained.

The New Testament enjoins no stated fasts, but several came into vogue subsequently, the fast of Lent taking the lead. In the 3rd century the Latins fasted on the seventh day. The Council of Mainz, in 813 A.D., ordered a fast the first week in March, the second week in June, the third week in September, and the last full week preceding Christmas. In the Roman Catholic Church there is a distinction between the days of fasting and of abstinence. The principal fast days of that church are the 40 days of Lent, All Saints, the Immaculate Conception, Rogation Days, Assumption of the Virgin, Whitsuntide, and the eves or vigils before certain festivals, as before Christmas Day. To these are to be added the Ember Days, these being the Wednesday, Friday, and Saturday after the first Sunday in Lent, Whitsuntide, the 14th of September, and the 13th of December. Abstinence is practiced on every Friday.

The Greek Church observes as fast days Wednesdays and Fridays; Easter, 48 days; Christmas, 39 days; and several others. The Episcopal and Anglican Churches recognize the fast as being praiseworthy, but give no directions concerning it. Their fasting days are every Friday, except Christmas Day; the 40 days of Lent; the three Rogation days before Holy Thursday; and the Ember Days at four seasons. The Protestant churches in general do not observe fast days, but require moderation in eating and drinking.

Fast, HOWARD MELVIN, author, born in New York, N.Y., Nov. 11, 1914. After a brief education he worked at odd jobs throughout the U.S. and then attended the National Acad. of Design, where he began to write, publishing his first novel in 1932. In 1953 he received a Stalin International Peace Prize, and for many years he was considered a Communist although he would not admit it. In 1957, however, he announced his resignation from the Communist party. His many books include "Two Valleys" (1932), "The Last Frontier" (1941), "Citizen Tom Paine" (1943), "Freedom Road" (1944), "The Naked God" (1957), and "Moses, Prince of Egypt" (1958).

Fat (*fāt*), a substance of a more or less oily character found in all the organs and tissues of the animal organism; also in the seeds and fruit of plants, less frequently in their roots, and in the trunks of trees during the winter rest. Of the organic foods of man and animals, fat furnishes the highest energy equivalent, 9.3 calories per gram of substance. The commoner fats are mixtures of the esters of the higher fatty acids, stearic, palmitic, and oleic, with the triatomic alcohol: glycerin. The consistency of a fat depends upon the proportions of the three glycerides, tristearin, tripalmitin, and triolein. In the hard, solid fats, such as tallow, tristearin and tripalmitin predominate; while in the semi-solid and liquid

fats, such as olive oil, triolein is present in abundance. The fat of the human body contains from 65 to 85 per cent of triolein and the fat of cold-blooded animals contains even more. Mixed glycerides, such as distearyl-olein, and higher molecular alcohols may also be present in small quantities. Where there is no danger of confusion, the triglycerides are usually referred to as stearin, palmitin, and olein. Some of the vegetable oils and fats contain other fatty acids in the form of triglycerides, which may either predominate or be a characteristic of the source:

<i>Source</i>	<i>Type of fatty acid in the fat</i>
Bayberry	Lauric
Nutmeg	Myristic
Peanut oil	Arachidic
Castor oil	Ricinoleic
Linseed oil	Linoleic and Linolenic
Rapeseed oil	Erucic

Olive oil, soya bean oil, coconut oil, and palm oil consist of mixtures of the glycerides of the various fatty acids mentioned. The fat from milk or butter contains glycerides of a number of fatty acids, comprising oleic, palmitic, stearic, myristic, lauric, arachidic, butyric, and caproic. The fish oils contain glycerides of the usual fatty acids and in addition, the triglyceride of clupanonic acid. Wool fat, or lanolin, consists principally of the fatty acid esters of a higher alcohol, cholesterol, and is more miscible with water than the commoner oils and fats; hence, its use as a base for ointments and emulsions. Stearic and palmitic acids are representative of saturated fatty acids, meaning that the four valences of the carbon atoms are all satisfied or saturated. Oleic, linoleic, linolenic, and clupanonic acids are unsaturated; they contain one or more carbon atoms with double linkage, lacking other radicles or atoms to satisfy all four affinities. On heating liquid fats or fatty acids with gaseous hydrogen in the presence of a catalytic agent, hydrogen is added to the carbon atoms at the site of the double bond, enabling olein, linolein, and the glyceride of linolenic acid to become hydrogenated into hard, stable stearin. This reaction makes available to the manufacturers of soaps and shortenings an increased number and variety of fats from which to choose for general or special products, and opens new markets to the vegetable oil industry. Cod-liver oil is rich in vitamins A and D. Castor oil is a purgative and, unless subjected to special treatment, contains a toxic substance, ricin. Fats have a high energy value for the animal organism, but are also stored in the body in excess of energy requirements. Sugar or starch can be converted into fat by the animal organism. Rancidity occurs when triglycerides of fatty acids are hydrolyzed by bacterial ferments into free fatty acid and glycerin. In butter, butyric

acid is one of the causes of the rank smell and taste. In other fats, oxidation products of the liberated fatty acids causes the unpleasant condition known as rancidity.

Fatalism (*jā'tal-iz'm*), from the Latin *fatum*, meaning fate; term signifying the belief that everything that happens is dependent on a predestined fate which can be neither avoided nor influenced by man. The Greeks believed in "ananke," a blind unreasonable fate which even the gods had to obey, and that an indefinable power "Moira" ruled the fate of gods, men, and nature. The Mohammedans, and to a certain degree the Jews, identify fate with the will of God, which cannot be recognized by men, and which, therefore, cannot be fought. The modern philosopher and the devout Christian alike cannot subscribe to any form of fatalism. For the modern philosopher everything that happens is connected with the preceding and successive events through the laws of nature. Therefore, if man acts in a certain direction, he initiates a sequence of actions which is different from the sequence which would have occurred if he had not so acted. For the Christian, events depend on the will of God, and God will determine them, but man through his action evokes God's will (see *Grace; Augustine, St.*).

Fata Morgana (*jā'tā mór-gā'nā*). See *Mirage*.

Fates (*fāts*), in Greek mythology, three deities believed to preside over the birth, life, and death of man. Clotho spun the web of life, Lachesis measured its length, and Atropos cut it off. They were identified with the Moirai, the three birth goddesses of the Greek religion. In Roman mythology the three Fates are known as the Parcae; in Teutonic mythology, they are the Norns. See also *Fatalism*.

Fathers of the Church, those ecclesiastics of the early Christian church whose writings are held authoritative in matters of scriptural and doctrinal interpretations. They flourished from ca. A.D. 100 to ca. 750 and include the Apostolic Fathers (*q.v.*); the four Fathers of the Greek Church—St. Basil the Great, St. Gregory Nazianzen, St. John Chrysostom, and St. Athanasius (*qq.v.*); and the four Fathers of the Latin Church—St. Ambrose, St. Jerome, St. Augustine, and St. Gregory the Great (*qq.v.*).

Fathom (*jāTH'ūm*), unit of length, equal to 6 ft., principally used for measuring lengths of rope and cable and in calculating the depth of water (see *Sounding*). The fathom presumably originated as the span covered by a man's arms when lifted sidewise at right angles to his body.

Fatigue (*jā-tēg'*), from the Latin *fatigare*, meaning tiredness. In physiology, fatigue is the result of muscular exertion. Such exertion leads to an accumulation of lactic acid in the tissues,

which causes the tired feeling. On resting, the muscle is able to cast off the lactic acid, after which normal feeling returns. The presence of lactic acid gives rise to a need for additional oxygen, and a person unable to obtain enough oxygen feels "out of breath" very rapidly. Fliers at high altitudes suffer from the same lack of oxygen and resulting fatigue unless they are supplied with special oxygen breathing equipment.

Profuse sweating depletes the blood of salt and fluids and gives rise to fatigue. Cold, pain, illness, insufficient food or sleep, or faulty nutrition may cause abnormal fatigue. Psychological states, e.g. boredom and anxiety, may be responsible for fatigue.

The term is also used in metallurgy. Fatigue in metals refers to the condition in which a metal item is broken by the constant repetition of a strain which is not of itself strong enough to break the item. The break is caused by a rearrangement of the crystal structure of the metal. In testing for fatigue resistance, a strain may be applied to the same piece as often as a million times. Fatigue is of great importance in anything subjected to jolting, such as an automobile. Although steels have been developed which show considerable resistance to fatigue, engineers must take account of it in their design. See also *Elasticity; Stress*.

Fatima (*jā'tī-mā*), the daughter of Mohammed the Prophet and his first wife, Kadijah, and the wife of Ali; born in Mecca, Arabia, ca. 606; died in Medina, in 632. She is the alleged ancestress of the FATIMITES, an Arabian caliphate which held sway over North Africa and Syria for more than two centuries (909-1171). Their claim to the caliphate was based on their reputed descent from Mohammed through Fatima.

Fatima, SHRINE OF OUR LADY OF THE ROSARY OF, a religious shrine outside Fátima, near Leiria, Portugal, dedicated by the Roman Catholic Church in 1951. It commemorates the miraculous appearance of the Virgin Mary to three shepherd children several times during the year 1917 in the Cova da Iria, a barren, rocky pasture, 1 m. from Aljustrel where the children were raised. As reported by the children, the Virgin Mary gave them messages of faith which they transmitted to Church authorities. During several appearances, the children related, predictions were made regarding the course of contemporary history, such as the ending of World War I in 1918 and the forecast of a greater conflict if man did not repair his ways.

Fatty Degeneration (*jā'tē dē-jēn-ēr-ā'shūn*). See *Degeneration*.

Faubourg (*jā-bōōr'*), the name applied in France to the suburb of a city, or to a district annexed to a municipality. St-Germain, a fashionable quarter of Paris, is a faubourg of Paris.

Faulkner (*fólk'nēr*) or FALKNER, WILLIAM (HARRISON), novelist, born in New Albany, Miss., Sept. 25, 1897; died in Oxford, July 6, 1962. He studied at the Univ. of Mississippi and served with the British Royal Air Force during World War I. His works dealt chiefly with the people of Mississippi and include "The Marble Faun" (1924), "Soldiers' Pay" (1926), "Mosquitoes" (1927), "The Sound and the Fury" (1929), "Sartoris" (1929), "As I Lay Dying" (1930), "Sanctuary" (1931), "Light in August" (1932), "Absalom, Absalom!" (1936), "The Hamlet" (1940), "Go Down, Moses, and Other Stories" (1942), "Intruder in the Dust" (1948), "Collected Stories"



WILLIAM FAULKNER

(1950), "Requiem for a Nun" (1951), "A Fable" (1954, Pulitzer Prize), "The Town" (1957), "The Mansion" (1959), and "The Reivers" (1962). He was awarded the 1949 Nobel Prize for literature.

Most widely known as a portrayer of degeneracy in Southern society, Faulkner displayed a morbidly brutal naturalism in the first part of his career. Implicit, however, were certain romantic qualities and overtones of moral affirmation, which later considerably amplified his significance as a novelist.

Fault (*fált*), in geology, a fracture in rocks along which there has been movement by one or both of the rock masses that are separated by the fracture. Faults result when compressional and tensional forces within the earth create stresses that the rocks cannot withstand. Displacement of rocks along a fault may vary from a fraction of an inch to several miles. The size of the angle made by the intersection of the fault

plane with a horizontal plane and the relative direction of movement of the rock units along the fault determines the kind of fault. Sudden movement of strata along the famous San Andreas fault caused the California earthquake of 1906.

Faun (*fān*), in ancient Roman mythology, one of many woodland gods with human torsos and goats' legs. The fauns were attendants of Faunus, an early king of Latium, who was later identified with the Greek Pan (*q.v.*). See *Satyrs*.

Faure (*fōr*), FRANÇOIS FÉLIX, president of France, born in Paris, Jan. 30, 1841; died there, Feb. 16, 1899. Faure was a wealthy merchant in Le Havre and served in the Franco-Prussian War before being elected (1881) to the Chamber of Deputies as a republican. He was under secretary for colonies and commerce (1882-85, 1888), vice president of the chamber (1893), and minister of marine (1894). Elected president of the Republic in January 1895, he concluded a notable Franco-Russian alliance. His administration was marked by the Fashoda Incident and the Dreyfus Affair (see *Dreyfus, Alfred; Fashoda*).

Fauré (*fō-rā'*), GABRIEL URBAIN, composer, born in Pamiers, France, May 12, 1845; died in Paris, Nov. 4, 1924. He studied under Saint-Saëns and other teachers and in 1866 became organist at Rennes, later at St-Sulpice and St-Honoré in Paris, and choir master (1877) and organist (1896) at Ste. Madeleine. He succeeded Massenet as professor of composition and counterpoint at the Paris Conservatoire in 1895 and from 1905 to 1920 was director of this institute. He was also a member of the Académie Française. Equally successful as a composer and a teacher, he counted among his pupils Maurice Ravel, Georges Enesco, and Nadia Boulanger.

Fauré's style, characterized by a truly French poetical lyricism, balanced form, restrained expression, and dignity, forms an important link between the late romanticism of César Franck and Debussy's impressionism. Among Fauré's numerous compositions are three operas ("L'Or-ganiste," 1885, "Prométhée," 1900, "Pénélope," 1913), the ballet "Masques et Bergamasques" (1920), the orchestral suite "Pelléas et Mélisande" (1898), a Requiem Mass (1887), chamber music, piano pieces, and many beautiful songs.

Fauriel (*fō-ryēl'*), CLAUDE CHARLES, historian and teacher, born in St-Étienne, France, Oct. 21, 1772; died in Paris, July 15, 1844. Educated at Tournon and Lyons, he was from 1830 professor of foreign literature at the Sorbonne. Fauriel's most important work was his "History of Central Gaul under the Domination of the Germanic Conquerors" (4 vols., 1836).

Faust (*foust*), opera by the French composer Charles-François Gounod (1818-93); first performed in 1859, it immediately won European acclaim. It is based on the drama "Faust," by

FAUST

Johann Wolfgang von Goethe (*q.v.*). The opera was first presented on an American stage in 1863 at the Acad. of Music in New York. It was the work chosen to open the Metropolitan Opera House in New York, 1883. One of the most often performed of operas, Faust was presented (1934) for the 2,000th time at the Paris Opéra alone.

FAUST OF FUST, JOHANN, famous printer, born in Mainz, Germany, about 1400; died in 1466. He was associated with Gutenberg in promoting the invention and introduction of printing. Writers generally credit him with furnishing the capital necessary to introduce the printer's art. His methods were preserved as secrets until Mainz was sacked in 1462, after which the workmen settled in different parts of Europe and revealed a great deal concerning the apparatus and materials employed. Faust is credited with printing a Bible in Latin, which is known as the Mazarin Bible. However, his published works were almost entirely in German; they include various texts, proclamations, and short treatises.

Faust, JOHANN, legendary sorcerer and scholar, who became celebrated in literature as the main figure of Goethe's "Faust." Allegedly he lived in one of the small towns of Germany in the 15th or 16th century. Certain details concerning his life occur again and again in the various versions of folklore which have developed since. Thus it is told that he studied theology at Ingolstadt, became a magistrate at the age of 19, and soon after abandoned theology for the study of astrology, medicine, and magic, in which he afterward instructed Johann Wagner, a clergyman's son at Wasserburg. Allegedly he made a contract with Satan, which he wrote in his own blood. The terms of the contract provided that Satan was to serve him 24 years, and at the expiration of that time his soul should pass into the possession of the Evil One. Accordingly, the spirit known as Mephistopheles aided him in working the magic arts and in securing visions of the spirit world. Many elements of this story can be found in Goethe's drama, "Faust," whose importance and real meaning go, of course, far beyond these elements of traditional folklore. Following Goethe's drama, Gounod composed an opera known by the same name; the story was likewise the inspiration for Christopher Marlowe's "Tragic History of the Life and Death of Doctor Faustus," as well as for many other writings and illustrations.

Faustina (*fous-tē'na*), in ancient Roman history, the name of a mother and daughter who became the wives of Roman emperors. Annia Galeria Faustina (died A.D. 141) was the wife of Antoninus Pius (A.D. 86-161). The younger Faustina (died A.D. 175) was the wife of Marcus Aurelius Antoninus (A.D. 121-180).



Courtesy Metropolitan Museum of Art, N. Y.
DR. FAUSTUS (JOHANN FAUST)
Etching by Rembrandt (1606-1669)

Favre (*fā'vr'*), JULES, statesman, born in Lyons, France, Mar. 21, 1809; died in Versailles, Jan. 20, 1880. He studied law and located in 1835 at Paris, where he became prominent as a lawyer and political liberal. In 1848, he became secretary general of the interior and opposed the presidency of Louis Napoleon. He spoke in opposition to the measures which caused the Franco-German War in 1870-71, though he afterward supported the national cause. Later he served as minister of foreign affairs. In 1876 he was elected to the senate.

Favus (*fā'vūs*), in medicine, a contagious skin disease. Caused by a parasitic fungus, the disease is characterized by dry yellowish encrustations, frequently cup-shaped, often having a peculiar musty odor. Although the disease may occur anywhere on the body, it usually affects the scalp.

Fawcett (*fā'sēt*), HENRY, political economist, born at Salisbury, England, Aug. 25, 1833; died at Cambridge, Nov. 6, 1884. He was graduated with honors from Cambridge in 1856, and studied law at Middle Temple, but soon discontinued it. While he was hunting with his father in 1858, a gun discharged by accident caused the loss of his sight. This misfortune did not discourage him, but rather increased his interest in study. He became professor of political economy at Cambridge in 1863. He entered Parliament as an advanced Liberal in 1865, and two years later he married MILLCENT GARRETT, who attained a reputation as speaker and writer on the civil rights of women. His earnest work in Parliament concerned reform

measures in India and the preservation of commons and forests for public use. In 1880 he became postmaster-general under Gladstone, inaugurating several reforms in the postal service. A national memorial at Westminster Abbey was erected to him. He wrote several books, including "A Manual of Political Economy" (1863) and "Free Trade and Protection" (1878).

Fawkes (*faks*), GUY, pro-Catholic conspirator, born in Yorkshire, England, in 1570; hanged Jan. 31, 1606. He was the leader in the famous Gunpowder Plot, by which the king and Parliament were to be blown up on Nov. 5, 1605. See *Gunpowder Plot*.

Fayal (*fā-yāl'*) or FAIAL, an island of the central group of the Azores, in the district of Horta, Portugal. Its area is 64 sq. m., and a part of the surface is mountainous, rising to 3,350 ft. The soil is fertile and the climate temperate. Among the chief products are livestock, cereals, fruits, and wine. Horta is the capital and principal town. Population, 1960, 49,735.

Fayetteville (*fā'ēr-vīl*), a city in northwest Arkansas, seat of Washington County, 130 m. E. of Tulsa, Okla. Located in the Ozark Mts., it is on the St. Louis-San Francisco Ry. Its industries are poultry packing, canning, lumber milling, and the processing of dairy products. In 1958 its value added by manufacture was \$8,244,000. It is the seat of the Univ. of Arkansas. The city, a popular summer resort, was settled in 1828 and incorporated as a city in 1893. Population, 1940, 8,212; in 1960, 20,274; in 1962, 22,887.

Fayetteville, a city in south central North Carolina, seat of Cumberland County, 50 m. S. of Raleigh, at the head of navigation on the Cape Fear River. It is on the Atlantic Coast Line and other railroads. It has a large trade in tobacco, lumber, cotton, flour, and naval stores, and among the manufactures are textiles, woodenware, and turpentine products. In 1958 it had a value added by manufacture of \$13,487,000. It is the seat of the State Teachers Coll.; Fort Bragg and Pope Air Force Base are located northeast of the city. It was settled in 1739 as Campbelltown and incorporated and named for Lafayette in 1783. From 1789 to 1793 it was the state capital. Population, 1940, 17,428; in 1960, 47,106.

Feather Grass (*fēTH'ēr grās*), a genus (*Stipa*) of grasses characterized by elegant and feather-like awns. There are approximately 100 species, growing in all but the coldest parts of the world. The common feather grass (*S. pennata*) is native to Europe and Asia. It grows in closely matted tufts, having numerous tall flower stalks with small florets, and the leaves have a dark green color. The tufts, if gathered before the seeds are ripe, retain their beauty throughout the winter. The long awns of some other species are dangerous to cattle.

Feathers (*fēTH'ērz*), the dermal growths forming the external covering or plumage of birds; comparable to the scales of reptiles. As a general rule, a feather consists of a central shaft, tubular at the base, and embedded in the skin as a plant is in the earth. On either side of the shaft is a web, or vane, consisting of barbs, or branches, and barbules. There are several types of feathers, arranged in characteristic patterns for each kind of bird; the contour, flight, and down feathers are the most important. Contour feathers appear on the body proper and give the bird its characteristic shape; flight feathers grow on the wings and tail; and down feathers cover the body beneath the contour feathers. The so-called pin feathers are degenerate, or incomplete, feathers, with central shafts and, possibly, terminal groups of barbs. Feathers are useful to the bird not only for flying, but also for insulation. When worn or broken, feathers are replaced in an annual or biannual process called molting. Glands located at the base of a bird's tail provide an oil which he spreads through his feathers to smooth and waterproof them.

February (*fēb'rōō-ēr-y*), the second month in our present calendar. It has 28 days, except in a leap year, when it has 29 days. It was first placed after January by the decemvirs of Rome in 252 B.C. Originally it had 29 days, but, when the seventh month was named after Augustus, a day was taken from it and added to August, making the latter month the same length as July.

Fechner (*fēč'nēr*), GUSTAV THEODOR, psychologist and philosopher, born in Gross-Särchen, Germany, April 19, 1801; died in Leipzig, Nov. 18, 1887. He studied and taught physics at the Univ. of Leipzig, but later became interested in experimental psychology and aesthetics. His many scientific works include "Elements of Psychophysics" (1860).

Federal (*fēd'ēr-əl*), from the Latin *foedus*, meaning league, akin to Latin *fides*, meaning faith. The term federal defines the activities of a league or union founded and motivated by common interests and good faith, such as a compact between states consolidated into a single nation, and delegating to a central government certain powers inherent in their separate capacities. It is commonly used as an adjectival name for the government of the U.S. (as in the agency names listed below).

Federal Aviation Agency, a U.S. government agency (abbreviated F.A.A.), created by the Federal Aviation Act of 1958 to take over, with integrated authority and scope, the functions of the Civil Aeronautics Admin., the Airways Modernization Board, and the Air Coordinating Committee, in addition to some of the functions of the Civil Aeronautics Board. The F.A.A. is charged with responsibility for apportioning

FEDERAL BUREAU OF INVESTIGATION

the use of airspace among civil and military users; for expanding, modernizing, and improving the Federal airways system; and for controlling the ever-growing volume of air traffic. The F.A.A. prescribes safety regulations, constructs and operates the Federal airways system of electronic and electrical aids to navigation, undertakes research to advance aviation facilities, and assures safety standards by examination of aircraft and pilots and other aviation personnel. See also *Aviation*.

Federal Bureau of Investigation, a bureau (abbreviated F.B.I.) of the U.S. Dept. of Justice, charged with the investigation of violations of Federal laws, except matters concerning counterfeiting and postal, customs, and internal-revenue violations. The F.B.I. investigates espionage, sabotage, treason, and other matters pertaining to internal security and makes all investigations under the Selective Training and Service Act.

The F.B.I. was established in 1908 but reached its greatest efficiency after 1924, when J. Edgar Hoover was appointed director. The complete reorganization which Hoover instituted included the founding of an identification division which includes a file of millions of fingerprints.

Federal Communications Commission, a U.S. government agency (abbreviated F.C.C.), established in 1934, which regulates all forms of radio and television transmission, as well as interstate and foreign communication by common carriers employing radio, wire, and ocean-cable facilities.

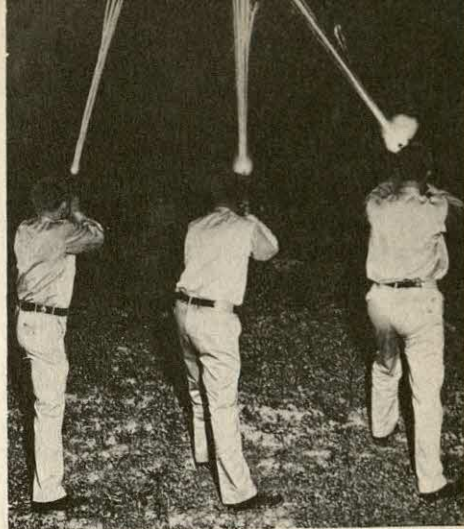
Federal Courts, the judicial system set up under the U.S. Constitution, which vests the judicial power of the U.S. in one Supreme Court (*q.v.*) and in such inferior courts as Congress may from time to time establish. Congress established the national judicial system by the Judiciary Act of 1789 and subsequent legislation. The 7th Amendment to the Constitution guarantees the right to trial by jury in the Federal courts.

The judiciary of the U.S. consists of the Supreme Court, 11 courts of appeal, and 94 district courts. There are also special courts, such as the court of claims, the customs court, and the court of customs and patent appeals.

The lowest Federal court is the *district court* where almost all litigation begins. An appeal may be taken from the district court to the *court of appeals*, and within certain limitations, a further appeal may be taken to the Supreme Court.

Each district court has its own seal, its own records and officials. There are a U.S. district attorney and his assistants, a U.S. marshal and deputies, and various clerks.

Federal courts have two kinds of jurisdiction: one depends upon the nature of the parties, as for example where the litigants are diplomatic offi-



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cers or citizens of different states or countries; and the second depends upon the nature of the subject matter, as for example, questions arising under the Constitution and laws of the U.S., admiralty and maritime matters, bankruptcy proceedings, and patents and trade-marks.

An action may be started in a district court when the amount in controversy exceeds \$10,000, exclusive of interest and costs, and the decision depends on the construction of the Constitution, treaties, or laws of the U.S., or on the validity of a statute. In such cases diversity of citizenship is not required. If the controversy does not depend upon the construction of the Constitution or the laws of the U.S., then the district court has jurisdiction if the controversy involves \$10,000 and there is diversity of citizenship, *i.e.*, the parties are citizens of different states. There are also specific statutes which give the district court jurisdiction regardless of the amount involved.

Prosecutions for violation of Federal statutes are conducted in the district courts.

Claims against the U.S. based upon the Constitution, the laws of the U.S., or regulations of any executive department, or on any contract must be initiated in the *court of claims*.

The *emergency court of appeals* established by the Emergency Price Control Act of 1942 had jurisdiction to review orders of the Price Administrator, and to restrain their enforcement, if arbitrary, capricious, or contrary to law, and if proper and timely protest was filed with the administrator.

The *customs court* has jurisdiction in matters relating to the U.S. customs laws. The final decision of the customs court and the decisions of the patent commissioner relating to patents and trade-marks may be appealed to the *court of customs and patent appeals*.

The *tax court*, an independent executive agency, has jurisdiction to adjudicate petitions for a redetermination of deficiencies in the pay-

ment of income, estate, or gift taxes, and to give judgment for amounts overpaid by taxpayers.

Federal Credit Unions, cooperative associations organized under the Federal Credit Union Act of 1934, as amended, and intended to encourage saving and provide low-cost credit to people of limited means. The individual credit unions are organized on a membership basis among groups of people having common bonds of occupation, association, or residence. They are chartered and supervised by the Bureau of Federal Credit Unions (of the Social Security Admin.). Currently, there are *ca.* 11,000 such unions in operation.

Federal Deposit Insurance Corporation, a Federal agency organized in 1933 to protect bank depositors. It insures deposits in all member banks of the Federal Reserve System (*q.v.*) on a compulsory basis and other banks not belonging to the system on a voluntary basis. The corporation regulates certain banking practices of all insured banks, may make loans necessary to avert losses or the closing of a bank, acts as receiver for all national (and some state) banks placed in receivership, and—up to a maximum of \$10,000—guarantees the claims of depositors against a bank in receivership. Currently, of the *ca.* 14,000 existing trust companies and commercial and mutual savings banks, about 13,400 are insured by the agency.

Federal Hall, the building, at Wall and Nassau Sts., New York City, used by the first national Congress when it met for the first time in 1789. Originally a city hall, the building was almost 100 years old and in a bad state of repair, but it was remodeled for the Congress with funds provided by private citizens. Used as the national Capitol only until 1790, the hall, on whose balcony George Washington was inaugurated (for illustration, see *President*), was eventually replaced by a U.S. customs house, which was later turned into a U.S. subtreasury. Since 1939, this building has been a national historical shrine.

Federal Home Loan Bank System, a system of 11 regional banks authorized under the Federal Home Loan Bank Act of 1932 to provide a credit reserve for savings and home-financing institutions. Membership in the system, regulated by the Federal Home Loan Bank Board, is open to savings and loan, building and loan, and homestead associations; savings and co-operative banks; and insurance companies. Members must meet certain standards and purchase stock in the system. Currently, there are over 4,800 members, with total assets of *ca.* \$81,000,000,000.

Federalist (*fěd'ēr-əl-ist*), *THE*, a series of essays published in favor of adopting the Federal Constitution of the U.S. They were written by

John Jay, Alexander Hamilton, and James Madison, in 1787 and 1788, and appeared in newspapers over the signature *Publius*.

Federalist Party, in the U.S., the first political party to have control of the government after the adoption of the Constitution. The term Federalist was originally applied to all who had urged the various states to ratify the Federal Constitution. However, when dissension began to develop within Washington's administration, Federalist came to mean specifically those who favored a strong Federal government in contrast to those who feared such centralization of power. The influence of the Federalists—including Alexander Hamilton (their chief spokesman), John Adams, George Washington, John Jay, and others—was dominant during the administrations of Washington and John Adams, at the time when the machinery of the new government was being set up. The district, circuit, and supreme courts were organized under the Federalists; the foreign and domestic debt was funded, and the Revolutionary War debts of the states were assumed by the Federal government; taxes were introduced, including customs tariffs and, later, excise taxes to provide revenue for the new government; and in 1791 the first national bank of the U.S. was chartered. A strong opposition to some of these measures was conducted by the Anti-Federalists—including Thomas Jefferson (their chief spokesman), James Madison, James Monroe, Edmund Randolph, Albert Gallatin, Elbridge Gerry, and others, who afterward became leaders of the Democratic-Republican party. This group drew to their support many laboring and agricultural groups (including large Southern landowners), who felt that the measures taken ran contrary to their own interests. The Federalists, weakened by division within their ranks, also hastened the decline of their popularity with the passage of the Alien and Sedition Laws (*q.v.*). From the time of Jefferson's election in 1800, Federalist party leadership seemed to fall more and more into the hands of the party's more reactionary elements. Always identified to some degree with the merchants and business interests centered in the North, the party became increasingly regional in character and strength. It was used by New England shipping interests to express their opposition to the Embargo Act of 1807 and, later, to the War of 1812. The successful course of the war and the Hartford Convention (*q.v.*), which brought suspicions of disloyalty on the Federalists, were important factors in finally destroying the party. Overwhelmingly defeated in the election of 1816, the party never again nominated a candidate on the national ticket.

Federal Maritime Commission, an independent regulatory agency of the Federal govern-

ment, established in 1961 under Reorganization Plan No. 7. The commission is composed of five members, appointed by the President with the consent of the Senate. No more than three members can be appointed from the same political party.

The commission exercises control over the following functions: (1) regulation of services, practices, and agreements of common carriers by water and other persons engaged in the foreign commerce of the U.S.; (2) acceptance or rejection of tariff filings of common carriers engaged in foreign commerce; (3) regulation of rates, fares, charges, classifications, tariffs, regulations, and practices of common carriers by water in the domestic offshore trade of the U.S.; (4) investigation of discriminatory rates, charges, classifications, and practices in the waterborne foreign and domestic offshore commerce; and (5) rendering of decisions, issuing of orders, and making of rules and regulations governing and affecting common carriers by water, terminal operators, freight forwarders, and other persons subject to the shipping statutes.

See also *Maritime Administration*.

Federal Reserve System, the central banking system of the U.S. Under the system, the country is divided into 12 districts, each with a regional "banker's bank" for all national banks and for state banks desiring to be Federal Reserve members. Member banks are required to own stock in their district Reserve banks (on which they receive a fixed annual dividend), and they must keep a certain proportion of their total deposits as reserves with their district Federal Reserve Bank, and they are permitted to borrow from the district bank.

The Federal Reserve System was established by law (the Federal Reserve Act of 1913) and is supervised by a Board of Governors appointed by the President of the U.S. with Senate approval. This board, which consists of seven members drawn from various industries and geographic regions of the country, is responsible for overseeing the operation of each district Federal Reserve Bank, for regulating some of the practices of its members, and for setting over-all credit policies that affect the money supply of the U.S. The Federal Reserve System is a quasi-government agency which is independent of the executive branch in making decisions but is answerable to the Congress for its actions.

The chief purpose of the Federal Reserve System is to maintain money supply and credit conditions in the U.S. that will promote a sound and growing economy. To accomplish this purpose, the system as a whole, and the district banks individually, are empowered to take various measures to restrict or expand the amount of credit that a member bank may extend to its

customers. Key measures are: raising and lowering the amount of legal reserves that member banks must keep in their district Federal Reserve Banks; buying and selling government securities on the open market (which serves to increase or decrease the amount of bank reserves available for lending purposes and, through them, the amount of "checkbook" money—bank deposits—circulating in the economy); and raising and lowering the discount rate, that is, the interest that member banks must pay on money they borrow from their district bank.

The Federal Reserve district banks, each of which handles banking for a large district of the country, are located in Boston, New York, Philadelphia, Cleveland, Richmond, Atlanta, Chicago, St. Louis, Minneapolis, Kansas City, Dallas, and San Francisco. See also *Bank and Banking*.

Federal Savings and Loan Insurance Corporation, a Federal agency created by Title IV of the National Housing Act to insure savings deposits in thrift and home-financing institutions. Insurance with the corporation, supervised by the Federal Home Loan Bank Board, is granted to savings and loan associations, homestead associations, and co-operative banks chartered by Federal and state governments and approved by the Federal Home Loan Bank Board. Currently, there are some 4,200 insured institutions, with combined total assets of ca. \$78,000,000,000. See also *Federal Home Loan Bank System*.

Federal Security Agency, a U.S. government agency, created in 1939 to consolidate the administration of all Federal agencies concerned with promoting social and economic security, educational opportunities, and good health among U.S. citizens. Among its component agencies were the Civilian Conservation Corps (*q.v.*), the National Youth Administration (*q.v.*), the Public Health Service (*q.v.*), the Office of Education, the U.S. Employment Service (transferred to the U.S. Labor Dept. in 1946), the Social Security Board, the Food and Drug Admin. (*q.v.*), and St. Elizabeth's Hospital. The agency was absorbed into the U.S. Dept. of Health, Education, and Welfare when it was established in 1953. See also *Social Security*.

Federal Trade Commission, a U.S. agency (abbreviated F.T.C.) created under the Federal Trade Commission Act of 1914. Originally charged with preventing unfair methods of competition and unfair or deceptive trade practices in commerce, the commission had its responsibilities broadened by the Clayton Act, the Export Trade Act, the Wool Products Labeling Act, the Fur Products Labeling Act, the Flammable Fabrics Act, and the Lanham Trade-Mark Act. Its functions are also concerned with preventing

such instruments of monopoly as exclusive dealing, price discrimination, and restrictive corporate mergers and interlocking directorates. It also must safeguard consumers from deceptive advertisement of food, drugs, cosmetics, and therapeutic devices; from the marketing of dangerously flammable material; and from the false labeling of wool and fur products. In addition, the F.T.C. checks the legality and use of trademarks and supervises exporter associations. The commission has no authority to punish, but it conducts investigations, issues complaints, and enters cease-and-desist orders.

Federal Works Agency, a U.S. administrative unit set up in 1939 to consolidate certain Federal agencies, including the Works Progress Administration (WPA), and the Public Works Administration (PWA). The agency made loans for the construction of public works. It was abolished in 1949, and its functions were transferred to the General Services Administration.

Federation (*fēd-ēr-ā'shūn*), an association of states or other units which grant certain administrative powers to a central or federal authority, while retaining control over local affairs. In a federation the rights and powers of the component units are constitutionally guaranteed and may not be infringed upon by the central government. There have been many examples of federation in the history of mankind; one of the first was the Achaean League, established by 12 city-states of ancient Greece before the Roman conquest in 146 B.C. The outstanding modern example of this kind of political organization is the U.S., which in 1781 adopted the Articles of Confederation (see *Confederation*).

Most federations are composed of member units having a considerable degree of linguistic and cultural homogeneity. However, many advocates of world peace believe that the principle of federation offers the best hope of bringing together the nations of the world in an association which will be strong enough to work for a common goal without sacrificing too much local autonomy. It was in this belief that the League of Nations, the United Nations (*q.v.*), and, more recently, the Council of Europe (see *Europe, Council of*) were formed.

Feeble-mindedness (*fē'b'l-mīn'ded-nēs*), a condition of deficiency in judgment, in intelligence, understanding, and the capacity for social, educational, and occupational adjustment, which is caused by lack of development rather than by deterioration. There are two criteria that must be present before diagnosis of feeble-mindedness is made: social incompetence and retarded intelligence. The condition is usually present from birth, but may occur as sequel to certain illnesses of the central nervous system or injuries that strike prior to maturation of the individual.

Those classified as feeble-minded range in level of functioning from idiot (I.Q. 0-25), imbecile (I.Q. 25-50), moron (I.Q. 50-70), to borderline mental deficiency (I.Q. 70-79). Higher-grade imbeciles can often learn very simple tasks, even to write and to function with moderate supervision in a routine, well-ordered environment. Morons can learn the basic tool subjects, as reading, writing, and arithmetic, and sometimes are employable. Most borderline mental defectives are not institutionalized because they are able to function in society. See also *Idiot*.

Earlier studies of feeble-mindedness placed major blame on heredity, but in a recent study of 7,907 first admissions to institutions for the feeble-minded, heredity was found to account for only 29 per cent of the cases. Prolonged and difficult delivery, producing asphyxia in the newborn, is believed to be one of the more frequent nonhereditary causes. Birth injury, certain infectious diseases, such as encephalitis, and endocrinal disorders often produce the disability.

Feehan (*fē'ān*), PATRICK AUGUSTINE, Catholic prelate, born at Killenale, Ireland, Aug. 28, 1829; died in Chicago, Ill., July 12, 1902. At the age of 16 he entered Castle Knock Coll., where he studied for two years; soon afterward, he began the study of philosophy and theology at Maynooth Coll. In 1852 he emigrated to America and was ordained in the latter part of that year. In 1865 he became bishop of the see of Nashville, where he was successful in reorganizing the diocese, which had been demoralized during the Civil War. He founded (1877) the Catholic Knights of America, a lay organization which has a large membership. In 1880 he was appointed first archbishop of the archdiocese of Chicago.

Feeling (*fē'l'ing*), in psychology, the power of the mind by which it is capable of experiencing or perceiving a mental act connected with some need or activity arising through the physical or the psychological nature. *Psychical feelings* have a purely mental source and arise from some conception or mental state. They are connected with some desire or activity, are accompanied by pleasure or pain, and ordinarily are preceded by knowledge, leading to volition. The feelings are the source of all joy and sorrow, and furnish the motives in view of which we choose to act or do. At first thought it may appear that knowledge alone leads to volition, but the influence exercised by desire and aversion is too apparent to be left out of account. Feelings are classified as *emotions*, *affections*, and *desires*. The simple feelings, as of joy and comfort, are emotions; those that go out toward an object, as of love, are affections; and those in which a wish to possess is manifested, as to possess food or clothing, are desires. See *Touch*.

Fehling Solution (*fā'ling sō-lū'shūn*), a laboratory reagent widely used in the estimation

and determination of certain sugars, such as glucose (*q.v.*). Fehling solution (developed by Hermann von Fehling, a 19th-century German chemist), actually consists of two solutions, which are mixed just before use. One consists of a solution of copper sulfate in water, the other is a solution of Rochelle salt (sodium potassium tartrate) and potassium hydroxide in water. When the two solutions are mixed a clear, deep-blue solution results. If this solution is heated with one containing glucose, a yellowish-red precipitate of cuprous oxide results. The amount of precipitate produced can be used to measure the amount of sugar present. Ordinary sugar (sucrose) does not give this test result. A modification of Fehling solution is Benedict's solution, which is especially suited for testing urine for glucose.

Feininger (*fē'nīng-ēr*), LYONEL (CHARLES ADRIAN), painter, born in New York City, July 17, 1871; died there, Jan. 13, 1956. Feininger went to Germany in 1887 to study music but became interested in painting instead. He worked as a newspaper cartoonist, specializing in the grotesque, from 1893 until 1907, when he began to devote himself to painting. He was influenced by the cubist work he saw in Paris in 1911 and evolved his own personal, poetic cubism. He chose architecture ("Viaduct," 1920) or ships as his subjects, turning their shapes into linear patterns of light. Feininger taught and worked (1919-33) at the Bauhaus, in Germany, and (1936 *et seq.*) intermittently in the U.S.

Feldspar (*fēld'spār*). See *Felspar*.

Felix (*fē'liks*), ANTONIUS, Roman procurator, fl. ca. A.D. 60. A Greek freedman, he was appointed by the emperor Claudius I as procurator of Judea in A.D. 52. Felix married Drusilla, youngest daughter of Herod Agrippa I and wife of the king of Emesa, whom he persuaded her to desert. At his trial before Felix in Caesarea (A.D. 60), having been sent there for allegedly inciting riots in Jerusalem, the Apostle Paul addressed Felix on righteousness, temperance, and the judgment to come (Acts 24:10-21). Because of his tyrannical behavior, such as ordering the death of the high priest Jonathan, Felix was recalled to Rome, where he barely escaped being condemned to death by Nero.

Feller (*fēl'ēr*), ROBERT WILLIAM ANDREW (known as Bob Feller), baseball player, born in Van Meter, Iowa, in 1918. A right-handed pitcher famed for his fast ball, Feller pitched for the Cleveland Indians throughout his baseball career. He established two major-league records by striking out 18 batters in a single game (1938) and by pitching 348 strikeouts in one season (1946). During World War II he served in the U.S. Navy. In 1951 he pitched his third no-hit game. Feller announced his retirement in 1956.

Felony (*fēl'ō-nī*), in law, one of the classifications of crimes, a generic term covering most of the more serious crimes. At common law, crimes were classified in three groups: treasons, felonies and misdemeanors. Treason then included a wide range of offenses against the state, and some crimes purely personal when committed by a member of a family against the head of the family. Since treason in the U.S. is defined by the Constitution as making war upon the U.S. only, the important distinction now is between felonies and misdemeanors.

At common law, a felony was any crime which was punishable by forfeiture of property; the term covered murder, rape, sodomy, robbery, larceny, arson, burglary, and mayhem. While forfeiture of property is no longer a punishment for crime, these crimes are still classified as felonies, and the classification has great practical significance. For example, in some jurisdictions prosecution for a felony must be by indictment (*q.v.*), though prosecution for a misdemeanor need not. Causing the death of a person unintentionally during the commission of a felony is murder, though causing the death of a person unintentionally during the commission of a misdemeanor is manslaughter. Certain civil disabilities attach to a conviction of felony, but not to a conviction of misdemeanor.

Legislatures may create new felonies in addition to those existing at common law, common examples being embezzlement and statutory rape.

Felspar (*fēl'spār*) or **Feldspar**, the generic name for a family of aluminous alkali silicate minerals of igneous origin. In some form it is a constituent of granite, gneiss, greenstone, and many other rocks, occurring in crystalline masses which break easily in two directions at right angles to each other. The colors are usually white, reddish, bluish, or greenish. Several species are of a fine grade, including those known as potash felspar, lime felspar, and soda felspar. The nearly colorless moonstone and gold-specked sunstone are rare and highly prized species of felspar. In decomposition, felspar yields clay and kaolin (*qq.v.*). It is utilized in the production of fiber and structural glass, floor and wall tile, and in the coating of welding rods and the manufacture of mildly abrasive scouring compounds. The main sources of felspar in the U.S. are confined to relatively small areas in North Carolina, South Dakota, Colorado, Arizona, and in the New England states. Georgia, Virginia, and California also produce small tonnages of this material.

Felt (*fēlt*), a cloth made without weaving by taking advantage of the tendency of certain fibers to interlace with each other. Various animal, vegetable, mineral, and man-made fibers are fabricated into numerous types of felt, the most commonly used principal ingredient being sheep's



Courtesy Ewing Galloway, N. Y.

FENCING

Straight lunge (*left*); parry and position of hand in tierce

wool. There is a wide range of fiber blends, varying according to the end use desired.

Felt is largely used for apparel and also has many industrial uses. An important characteristic is that it will not fray or ravel and may be cut in any direction. Its mechanical uses include filtration, sealing, wicking, shock-absorbing, vibration isolation, lubrication, padding, polishing, grinding, and other technical uses. Wool felt is extensively used in the field of medicine and surgery; in musical and scientific instrument manufacture, notably pianos; and in numerous household applications, as in curtains, rugs, table covers, weather-stripping, roofing, etc.

Hats are made of both wool felt and fur felt, the latter largely used for the finer, more expensive grades. Fur felt manufacture differs somewhat from wool felt production in manufacturing processes.

Femur (*fě'mūr*), in anatomy, the bone of the thigh. It is the largest bone in the human body and if broken is specially slow in healing.

Fencing (*fěn'sing*), originally the art of attack and defense with a sword (*q.v.*). At present, it is a highly technical and internationally organized sport. In the history of combat, many different types of swords have been used. A heavy, double-edged sword was first used to crush or cut the armor worn by ancient and medieval warriors. Later, it was deemed more expedient to quell an opponent by piercing the joinings of his armored suit. This necessitated a light, sharp-pointed weapon, which led to the development of the

FÉNELON

rapier. As the use of armor declined after the introduction of firearms, fencing weapons became more and more refined.

Today, fencing survives only as a sport. A fencer uses three principal types of weapons—the *foil*, the *épée*, and the *sabre*. The foil, light, maneuverable, and quadrangular when seen in cross section, is the most academic and scientific of the three. From its use as a practice weapon, fencing developed from a means of combat to a highly skillful sport. The *épée* (dueling sword) is a narrow, stiff weapon, triangular when seen in cross section, and without cutting edges; the *sabre* is also light and triangular, but has a simulated cutting edge. All three weapons are 35" in length, straight, and blunted at the point. The use of each is strictly bound by particular rules of conduct.

The foil and the *épée* are thrusting weapons only; touches, therefore, can only be scored with the point. The foil target is the body, exclusive of the head, arms or legs, while the *épée* target is the entire body. The *sabre*, however, is both a thrusting and a cutting weapon, whose target is the body exclusive of the legs.

Fencers attack and parry on a strip of matting about 40 ft. long and 6 ft. wide. In addition to the standardized weapons, fencers require protective equipment, such as a padded jacket, a mask, and a glove. Since action takes place so rapidly, a fencing bout is one of the most difficult sports to referee. A director and four judges act on rulings. Recently, an electrical recording machine has been developed to determine the winner of a bout.

International fencing tournaments are held annually, and, since 1920, fencing has been part of the Olympic Games program. For intranational tournaments each member nation has its own organization; in the U.S., it is the Amateur Fencers League of America.

Noted U.S. fencers are Joseph M. Leavis, Leo G. Nunes, Norman C. Armitage, and Helene Mayer, the world's greatest woman fencer. See *Duel*.

Fénelon (*fā-n'-lōn'*), FRANÇOIS DE SALIGNAC DE LA MOTHE, prelate and author, born at the Château of Fénelon in Périgord (Dordogne), France, Aug. 6, 1651; died in Cambrai, France, Jan. 7, 1715. He was educated at home and at the nearby Univ. of Cahors. After a period in Paris, he entered the seminary of St. Sulpice and took holy orders in 1675. In 1679 he was appointed director of a convent for converted Huguenot women. Following the revocation of the Edict of Nantes (*q.v.*) in 1685, he headed a mission which preached to the Protestants of Saintonge. His ability was soon called to the notice of Louis XIV, who appointed him preceptor to his grandson, the Duke of Burgundy, in 1689. His success in this

capacity was awarded by a royal appointment to the abbey of St.-Valery and soon after to the archbishopric of Cambrai. The exceptional ability and breadth of character of Fénelon were shown in a long controversy with Bossuet, who had denounced him as a heretic, which ended Mar. 12, 1699, by an adverse decision of the Pope. Perhaps no life of the 17th century presents a greater devotion to Christianity and the elevation of mankind in moral goodness than that of Fénelon. He was distinguished as an educator chiefly because he advocated the general education of women. His body was buried in the Cathedral of Cambrai. His publications embrace treatises on theology, philosophy, literature, history, and oratory. The most noted are: "The Maxims of the Saints" and "The Temporal Power of the Medieval Popes."

Fenestration Operation (fĕn-ēs-tră'shŭn 6p-ĕr-ă'shŭn). See *Deaf, The*.

Fengtien and Shengking (jŭng'ti-ĕn', shŭng'king), a former province of South Manchuria, comprising several provinces. With its capital, Mukden (formerly called Fengtien also), the province was under Japanese control from 1932 to 1945. After World War II its area was reduced, and in 1949 it formed part of the province of Liaoning, in turn a merger of the provinces of Liaosi and Liaotung. Situated in a highly industrialized region, the former province had an area of ca. 29,000 sq. m. Population, ca. 10,000,000.

Fenians (fĕ'nĭ-anz) or FENIAN BROTHERHOOD, a revolutionary society that flourished from 1863 to 1870, aiming at forcible liberation of Ireland from Britain. Deriving its name from the *fianna*, a legendary 3rd-century band of Irish warriors, it was founded in the U.S. in 1858 by John O'Mahoney (1816-77). He was aided by James Stephen (1825-1901) in Ireland, who founded (1863) in Dublin a revolutionary journal called the *Irish People*. The Irish wing, sometimes known as the Irish Republican Brotherhood, was denounced by the Church, and it never actually became popular in Ireland. After a convention in Chicago in 1863, the Fenians increased their agitation, and in 1865 many Irish-American veterans of the Civil War went to Ireland to stage an uprising. The government suppressed the *Irish People* and arrested several prominent Fenians. In 1865 the American brotherhood split into two groups: one, headed by O'Mahoney, advocated revolutionary action in Ireland; the other, under William Randall Roberts (1830-97), wanted to attack Canada and made three unsuccessful assaults (1866, 1870, 1871). A more liberal approach on the part of the British toward Irish claims helped to reduce the effectiveness of the Fenians. Moreover, movements headed by Charles S. Parnell and, later, the Sinn Féin (q.v.) helped to return the independence campaign to Irish soil and

led to the decline of the Fenian organization, which had its main strength overseas, especially in Canada and the U.S. See *Ireland*.

Fennec (fĕn'ĕk), a small animal of Africa, resembling a small fox. The tail is nearly as long as the body, which has a length of a foot, and the ears are 3 in. long. It has a yellowish color, except the tip of the tail, which is black and bushy. The fennec is native to the Sahara Desert and is called Sahara fox by some writers. It burrows in the ground, where it spends most of the day, and at night comes out in search of food. It subsists on insects, birds, mice, and lizards.

Fennel (fĕn'nĕl), a fragrant umbelliferous plant cultivated in gardens to a considerable extent for its aromatic qualities. The flowers are small and yellow or white, and the leaves, sometimes used in cookery, are finely divided.

Ferber (fĕr'bĕr), EDNA, novelist and short-story writer, born at Kalamazoo, Mich., Aug. 15, 1887. She began her career as a reporter on the *Appleton Daily Crescent* (1904), working later on the *Milwaukee Journal* and *Chicago Tribune*. Her literary career began with the novel "Dawn O'Hara" (1911). Among her widely read novels are "So Big" (Pulitzer Prize, 1925); "Show Boat" (1926), later produced as a musical and a motion picture; "Cimarron" (1929); "Come and Get It" (1935); "Saratoga Trunk" (1941), also made into a picture; "Great Son" (1945); "Giant" (1952),



EDNA FERBER

also filmed; and "Ice Palace" (1958). Her plays (written with George S. Kaufman) include "Dinner at Eight" (1932) and "Stage Door" (1936). She also wrote an autobiography, "Peculiar Treasure," in 1939.

Ferdinand I (fĕr'di-nānd), sovereign of the Holy Roman Empire, born in Alcala, Spain, Mar. 10, 1503; died July 25, 1564. He was the son of Philip I and brother of Charles V of Germany,



FERDINAND I

whom he succeeded as Holy Roman Emperor in 1556. He married Princess Anna of Hungary in 1521, became King of Bohemia and Hungary at the death of Louis, brother of his wife, in 1526, though his claim was contested, but by the aid of the Turks he secured recognition. Ferdinand was elected emperor on the abdication of Charles V, and during his brief reign attained a reputation for ability, justice, and enlightenment. Among other wholesome measures, he reformed the monetary system, conciliated his subjects in religious affairs, and added Hungary and Bohemia to his empire. He was succeeded on the imperial throne by his son, Maximilian II.

Ferdinand II, sovereign of the Holy Roman Empire, born in Graz, Austria, July 9, 1578; died in Vienna, Feb. 15, 1637. He was the grandson of Ferdinand I, being the son of Charles, Duke of Styria. His education was wholly under the Jesuits. In 1619 he ascended the throne. The training and sentiment of Ferdinand were in strong opposition to the Protestant Church, and he began early in his reign to seek the extermination of all holding to that confession of faith. The religious war that commenced in the duchy of Styria and Bohemia soon spread over a large portion of the empire and the adjacent countries, and has gone down in history as the Thirty Years' War. It had begun to appear that the Protestant faith would be forever stamped out of Europe under the leadership of the imperial forces by Wallenstein, when Gustavus Adolphus of Sweden unexpectedly crossed into Germany, meeting the imperial forces at Lützen on Nov. 6, 1632, and there dealt a complete defeat to the designs of Ferdinand. The ability demonstrated by the Swed-

ish generals was more than equal to that of the Austrian leaders. Shortly after the Battle of Lützen, Ferdinand caused Wallenstein to be assassinated because he feared the rising power of that general. His reign was marked with many disastrous battles, while armies organized under his imperial command left nothing but ruin and desolation in their track.

Ferdinand III, sovereign of the Holy Roman Empire, born in Graz, Austria, July 20, 1608; died Apr. 2, 1657. He was the son of Ferdinand II and succeeded him to the throne in 1637. His disposition was milder than that of his father, and he showed less fanaticism in his support of the ecclesiastical party. Religious toleration was granted in most parts of the empire, and the German nation began to recover from the fearful ravages of the great wars that had demoralized trade and destroyed more than half the population. Concessions were granted in the interest of peace to independent princes, while France obtained part of Alsace and Lorraine and Sweden obtained western Pomerania. The German empire practically ceased to exist at the death of Ferdinand III, and was not re-established until the new German empire rose under William I, after the close of the Franco-Prussian War in 1870-71.

Ferdinand I, surnamed the Great, first sovereign of independent Castile, born in the year 1000; died Dec. 27, 1065. He succeeded to the throne in 1035. In 1053 he defeated his brother, Garcia III, King of Navarre, who had attacked his army, and extended his dominions by annexing a number of provinces previously governed by the defeated sovereign. He entered upon a plan early in his reign to suppress the Moors, for which purpose he extended the Christian frontier from the Douro to the Mondego, and reduced to vassals the emirs of Saragossa, Toledo, and Seville. Shortly after he claimed the title of Emperor of Spain, though a decision rendered at the conference held in Toulouse conceded him only the portions conquered from the Moors.

Ferdinand II, King of Leon, younger son of Alfonso VIII, ascended the throne in 1157; died in 1188. His reign of 31 years is obscure, but is marked most distinctly by the successes over the Moors and the incorporation of the noted military order of Alcantara under sanction of Pope Alexander III in 1177. His death occurred at Benavente, and his son, Alfonso IX, succeeded him.

Ferdinand III, King of Castile, known as St. Ferdinand, son of Alfonso IX, born in 1199; died at Seville, May 30, 1252. Henry I of Castile died without issue in 1217, and Ferdinand III was proclaimed king in 1230, immediately succeeding his father. The events for which his reign is most distinguished include the vigorous wars waged against the Moors. His most celebrated victories were those at Ubeda in 1234, at Cordova in 1236,

and at Seville in 1248. In the latter part of his reign he planned an expedition to Africa, but died before his hopes could be realized. Pope Clement IX canonized him in 1671 on account of his zeal in the Christian cause. The Spanish calendar designates his fast-day as May 30.

Ferdinand IV, King of Castile and Leon, born in Seville in 1285, succeeded his father, Sancho IV, in 1295. His reign of 17 years became renowned by several successful wars against the Moors. His death occurred at Jaén while on a campaign, Sept. 7, 1312.

Ferdinand V, King of Castile, II of Aragon, III of Naples, and II of Sicily, born in Aragon, Spain, Mar. 10, 1452; died Jan. 23, 1516. He was the son of John II of Navarre and Aragon, was recognized as heir apparent to the crown on the death of his brother Carlos in 1461, and was associated with his father in the government of Aragon as early as 1468. About the same time he was declared King of Sicily by his father. In October 1469, he married Isabella, the sister and heir of Henry IV of Castile, at Valladolid. When Henry IV died in 1474, Ferdinand and Isabella were recognized as joint sovereigns of Castile. In 1478 he reorganized the Inquisition as a means to further religious ends. His zealous support of the Catholic princes in Spain caused the expulsion of 160,000 Jews and the termination of Moorish power in Spain in the year 1492. Soon after, he added Navarre and Naples to his possessions and formed the entire Iberian peninsula into one state, with the exception of Portugal. The most interesting event connected with his reign is the discovery of America by Columbus, though the honor of granting royal support belongs wholly to Isabella. Ferdinand V was a crafty and ambitious ruler, but in character he lacked both stability and veracity.

Ferdinand VI, King of Spain, son of Philip V, born in Madrid, Sept. 23, 1713; died Aug. 10, 1759. He ascended the throne in 1746, and entered at once upon a vigorous attempt to conclude the war with England that had been waged since 1739, which resulted in the Treaty of Aix-la-Chapelle in 1748. Dying without issue, he was succeeded by his half-brother, Charles III.

Ferdinand VII, King of Spain, born at San Ildefonso, Oct. 13, 1784; died Sept. 29, 1833. He was the eldest son of Charles IV and of Maria Louisa of Parma, became Prince of Asturias in 1788, and, when his father was forced to abdicate on account of a popular rising in March 1808, he ascended the throne. A month later Napoleon compelled him to abdicate and conferred the sovereignty upon Joseph, brother of Napoleon. When the imperial army of France was defeated at Vittoria on June 21, 1813, by Wellington, Ferdinand was permitted to re-enter Spain and occupy the throne on the condition that he would

expel the English from the peninsula. The arbitrary reign of Ferdinand caused an insurrection in 1820, but Louis XVIII of France sent an army to aid him, by which his authority again became supreme. The act of 1713, passed during the reign of Philip V, excluded women from the throne of Spain, but this Ferdinand set aside to make place for his daughter, Isabella, and thereby excluded his brother, Don Carlos. The reign of Ferdinand was generally unsuccessful, being marked by numerous insurrections, the loss of most of the colonial territory in America, and a consequent widespread disruption of commercial and manufacturing enterprises in Spain.

Ferdinand I, King of Naples, son of Alfonso V of Aragon, born in 1424; died Jan. 25, 1494. Although he succeeded to the throne in 1458, he was not recognized by Pope Calixtus III, who championed the cause of John of Anjou. The latter defeated him July 7, 1460, but, when Pius II recognized Ferdinand, he secured a victory over John of Anjou, Aug. 18, 1462, thereby attaining supremacy.

Ferdinand IV, King of Naples, born in Naples, Jan. 12, 1751; died Jan. 4, 1825. His father ascended the throne of Spain in 1759, and Ferdinand became his successor on the throne of Naples, under a regency. He married Maria Carolina, daughter of Empress Maria Theresa, in 1768.

Ferdinand I, King of Rumania, born at Sigmaringen, Prussia, Aug. 24, 1865; died July 20, 1927. He married Marie, daughter of the Duke of Saxe-Coburg and Gotha, in 1893, and in 1914 succeeded his uncle, Charles I. Although a Hohenzollern, he joined the Allies in World War I.

Ferdinand I, King of Bulgaria, Duke of Saxe-Coburg, born at Vienna, Austria, Feb. 26, 1861. He was chosen Prince of Bulgaria on July 17, 1887, by the grand national assembly at Tirnova, subscribed to the constitution, and on Aug. 14, 1887, assumed the reins of government under the title of Ferdinand I, although his election was not confirmed by the Sultan of Turkey, or by the treaty powers. On Apr. 8, 1893, he married Marie Louise, daughter of the Duke of Parma of the House of Bourbon. Shortly after, he joined the Greek Church, a course taken as a step toward securing the confidence of the Russian government, and his policy was marked largely by influences exercised through Muscovite diplomats, though in the main he was eminently successful. In 1908, Bulgaria became independent and he assumed the title of Czar. The defeat of his armies in World War I on the side of Germany compelled him to abdicate in 1918.

Fergus Falls (*fēr'gūs fālz*), county seat of Otter Tail County, Minnesota, on the Otter Tail River, 186 m. n.w. of Minneapolis. It is on the Northern Pacific and the Great Northern R.R.'s. It has manufactures of flour, ironware, clothing,

cigars, and machinery. It was settled about 1861 and incorporated as a city in 1863. Population, 1940, 10,848; in 1950, 12,917; in 1960, 13,733.

Ferguson (*jēr'gū-sūn*), **ELSIE**, actress, born in New York, N.Y., 1883; died in New London, Conn., Nov. 18, 1961. Outstanding stage and screen personality, she began her career in "The Liberty Bells" (1901) and played leading roles in "Such a Little Queen" (1909), "Dolly Madison" (1911), "Primrose" (1912), and "The Unseen Empire" (1914). Her first motion picture was "Barbary Sheep" (1917), followed by such successes as "The Avalanche" (1919), "The Witness for the Defense" (1919), and "Forever" ("Peter Ibbetson," 1921). Her later stage roles included "She Stoops to Conquer" (1924), "The Grand Duchess and the Waiter" (1925), "Scarlet Pages" (1929), and "Outrageous Fortune" (1943). In her will she left between \$1,500,000 and \$2,000,000 for the support of various hospitals and shelters for animals.

Ferguson, **HOMER**, jurist, politician, born in Harrison City, Pa., Feb. 25, 1889. He was graduated from the Univ. of Michigan in 1913, was admitted to the Michigan bar in the same year, and practiced law until 1929, when he became a circuit judge. He was elected to the U.S. Senate for the term beginning in 1943 and served until 1954. During his tenure he was influential as a member of the Senate Judiciary, War Investigating, Appropriations, and Foreign Policy committees. He was also chairman of the Republican policy committee. Defeated for re-election in 1954, he was U.S. ambassador to the Philippines (1955-56), resigning that post to become associate judge of the U.S. court of military appeals.

Ferguson, **JAMES**, astronomer, born near Keith, Scotland, in 1710; died in London, Nov. 16, 1776. The son of poor parents, he studied astronomy while a boy tending sheep, and he later made good use of his careful observations when constructing a celestial globe and astronomical apparatus. Subsequently he studied at Edinburgh, where he became skilled in mathematics and drawing. Later he supported himself by making portraits. Moving to London in 1743, he engaged in painting and gave a course of lectures on experimental astronomy. George III, then Prince of Wales, was attracted to his lectures and afterward gave him a pension of \$250 a year. Among Ferguson's principal works are "Lectures on Mechanics," "Astronomy Explained Upon Newton's Principles," and "Select Mechanical Exercises."

Fergusson (*jēr'gū-sūn*), **ROBERT**, poet, born in Edinburgh, Scotland, in 1750; died in Darien House Asylum, Edinburgh, Oct. 16, 1774. He was educated at St. Andrew's and became a lawyer's assistant. At the age of 21 he began contributing poetry to *Ruddiman's Weekly Magazine*. He used the simple life and language of Edinburgh's poor

as material for many of his poems. He was a major influence on the early works of Scottish poet Robert Burns (*q.v.*), who stated that his "Holy Fair" was inspired by Fergusson's "Leith Races." Fergusson suffered a severe head injury and died insane.

Fergusson, **SIR WILLIAM**, Scottish surgeon and medical inventor, born at Prestonpans, Scotland, March 20, 1808; died in London, England, Feb. 10, 1877. He introduced new methods for bone surgery and correction of cleft palate. Among his inventions are several types of surgical forceps and the vaginal speculum.

Fermentation (*jēr-mēn-tā'shūn*), a change which takes place in most animal and vegetable substances when they are exposed to air and moisture at ordinary temperatures. It is a chemical decomposition of an organic compound induced by chemical agents or by living organisms. In the former, called *unorganized* or *chemical* ferments, the enzyme causes a structural change without losing its identity, as in digestion; while in the latter, called *organized* ferments, the action is due to the growth of the ferment, as in the formation of acetic acid from alcohol by the action of the vinegar plant. The various organisms which produce fermentation apparently derive their nourishment from the original compound, and yield products that are poisonous to the ferment. It is for this reason that chemical decomposition ceases when fermentation products are in excess, or the nutriment is exhausted. It is arrested by certain substances, such as salt and alcohol, called *antiseptics*, as well as by heat and cold.

Several kinds of fermentation are recognized, the name depending upon the specific product obtained. In *alcoholic* fermentation the sugar contained in liquids is converted into carbonic acid, alcohol, and glycerin; in *acetic*, the spirituous liquors became acid and produce acetic acid; and in *putrid* fermentation, organic substances are altered in various ways, the alteration depending upon the nature of the substance, and poisonous gases are generally set free. Besides these are: *ammoniacal*, yielding ammonia; *benzoic*, yielding benzoic acid; *amylic*, yielding amylic alcohol; *viscous*, yielding a gummy mass; *lactic*, yielding lactic acid; and *butyric*, yielding butyric acid.

The various kinds of fermentation may be effected at different degrees of temperature, varying from about 24° to 104° F. In digestion the ferments of the pancreas act on fibrin at 90°. Viscous fermentation, in which wine is made thick and viscous so it forms threads when poured, occurs at a temperature of from 60° to 104°. Alcoholic fermentation under certain conditions takes place readily at 24° to 30°. The ferments employed to excite fermentation are mostly organic, though there are many of an inorganic

nature. Among the most common fermented liquors containing alcohol and used as beverages are wine, made from the juice of grapes; mead, from honey; cider, from apples; ale or beer, from an infusion of malt; and chicha, from maize. The last mentioned is made in large quantities in South America. See *Beer*.

Fermi (*fär'mē*), ENRICO, physicist, born in Rome, Italy, Sept. 29, 1901; died in Chicago, Ill., Nov. 28, 1954. As a professor of theoretical physics at the Univ. of Rome (1927-38), he began his research on atomic physics, bombarding atoms with neutrons. In 1938 he was awarded the Nobel Prize for physics for his identification of new radioactive elements produced by bombardment and for his discovery of nuclear reactions effected by slow neutrons. Under his direction, the first controlled atomic chain reaction was accomplished in Chicago, in 1942. After leaving Italy in 1938, he taught at Colum-



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ENRICO FERMI

bia Univ. (1939-45) and Univ. of Chicago (1946-54), where he had conducted atomic research.

Fernandez (*fēr-nān'dēz*), JUAN, navigator, born in Spain in 1536; died in 1602. He became a navigator at an early age and for 40 years promoted explorations and settlements in South America. In 1562 he discovered the island of Fernando do Noronha, a small island in the South Atlantic Ocean, about 200 m. N.E. of Cape St. Roque. Enchanted with the beauty of this island, he established a colony there, but it proved a failure. In 1590 he settled in the mountains of Chile, where he remained until his death.

Fernandina (*fēr-nān-dē'nā*), county seat of Nassau County, Florida, on Amelia Island, 35 m. N.E. of Jacksonville. It is on the Seaboard Air Line R.R. and has a good harbor on the Amelia River, which separates the island from the con-

continent. The city has a large trade, both inland and foreign, in lumber, cotton, phosphates, and merchandise. A fine shell road extends to Amelia Beach. One of the oldest settlements in America, Fernandina is the site of historic Ft. Clinch in what is now a state park. Fernandina was settled by the Spaniards about 1630 and was incorporated in 1859. Population, 1950, 4,420.

Fernando Po (*fēr-nān'dō pō*), an island belonging to Spain, located in the Bight of Biafra, about 20 m. off the west coast of Africa. It is 42 m. long and 20 m. wide, and has an area of 768 sq. m. The surface is mountainous, but the soil is fertile and well watered. Clarence Peak, the highest summit, has an altitude of 11,025 ft. The climate is hot and unhealthy. Among the chief products are rice, bananas, corn, yams, and livestock. The Portuguese discovered the island in 1471, but it became a part of Spain in 1887. Santa Isabel, the chief town, has a population of 1,500. The island is inhabited chiefly by native Negroes and Portuguese. Population, ca. 22,600.

Ferndale (*fēr-nā'dāl*), a city of Oakland County, Michigan, 9 m. N.E. of Detroit. There are a number of factories making tools, paints, steel tubing, and automobiles, but Ferndale is chiefly a residential area. Population, 1930, 20,855; in 1940, 22,523; in 1950, 29,675.

Ferns (*fērnz*), a class of leafy but flowerless plants, springing from a rhizome, which creeps on the surface of the ground, or rises in the air like the trunk of a tree. This trunk does not taper, but is of equal diameter at both ends. The reproductive organs consist of spore cases and are attached to the veins at the under surface of the leaves, or at their margins. Most ferns are comparatively small, while some tree ferns reach 60 ft. in height. Seventy-five genera and about 4,000 species are known. Some ferns yield products useful for food, while other species contain properties which are of value in medicine for expelling tapeworms. The fronds of ferns, or their impressions, are frequently met with in a good state of preservation as early as the middle of the Silurian period.

Ferrara (*fēr-rā'rā*), a city in Italy, capital of a province of the same name, situated on the Po River, about 26 m. N.E. of Bologna. The site is low and unhealthy, but the streets are broad and well paved. It is an ancient city and has many towers and bastions. Among the most beautiful of ancient buildings are the old ducal palace and several cathedrals. A number of fine monuments are in the public places, one being dedicated to Savonarola, who was born here. The public library contains 100,000 volumes. It has modern municipal facilities, and railroad and telephone connections are well established. Among the manufactures are pottery, clothing, utensils, and machinery. Ferrara was an important city in ancient

times, when it had 100,000 inhabitants, and its university dates from 1264. It was long held as a fief of the popes, came under the rule of the house of Este, and in 1797 was united with the Cisalpine Republic. In 1814 it was restored to the popes, but has been a part of Italy since 1859. Population, *ca.* 103,500.

Ferrero (*jě'r-rō*), GUGLIELMO, historian, born near Naples, Italy, 1871; died in 1942. After studying at Pisa and Bologna, he worked with the well-known psychiatrist, Cesare Lombroso, publishing "The Female Offender" (1895). He lectured at Milan (1898), in France (1906), and in America (1908), after visiting South America (1907). In 1930 he became professor of modern history at Geneva Univ., Switzerland. Best known for his history, "Greatness and Decline of Rome" (1907-09), he also wrote "Ancient Rome and Modern America" (1914), "Four Years of Fascism" (1924), "The Life of Caesar" (1933), "The Reconstruction of Europe" (1941), and "Principles of Power" (1942). Ferrero was one of the foremost historians of his time, bringing to his detailed studies of historical periods the added knowledge of the expert sociologist.

Ferret (*jě'r-rēt*), a carnivorous animal of the weasel family, but closely allied to the polecat. In form and size it approaches the common mink. It is native to Africa and cannot endure excessive cold. The representative species are about 14 in. long and of a yellowish color. Ferrets are much used, both in America and Europe, for destroying rats and for driving rabbits out of their places of seclusion. Several species are carefully bred in captivity, in which state they subsist on bread, raw meat, and milk. The *black-footed ferret*, found in the western plains of North America, is a species of the weasel. It is about 2 ft. long, has a pale brown color, and the feet and tip of the tail are black. This animal is seen in the towns of prairie dogs, upon which it feeds.

Ferris (*jār'is*), GEORGE WASHINGTON GALE, engineer, born in Galesburg, Ill., in 1858; died in 1896. He was taken to California by his parents at an early age, where he received his elementary education, and in 1881 was graduated at Troy, N.Y., from the Rensselaer Polytechnic Inst. Shortly after he located in business at Pittsburgh, Pa., engaged in extensive construction work, and, when a special structure was desired for the Columbian Exposition that should rival the Eiffel Tower, he devised the celebrated Ferris Wheel (*q.v.*), which attracted universal admiration at Chicago in 1893, and at St. Louis in 1904, and was a source of much profit to the promulgators of the enterprise.

Ferris Wheel (*jār'is hwēl*), an immense structure designed and invented by G.W.G. Ferris, and constructed in Chicago in 1893 as a popular feature in the Midway Plaisance at the

Columbian Exposition. This great wheel, the largest ever built, contained two wheels of the same size that were securely connected by struts and rods. An axle 31 in. in diameter and 45 ft. long was at the center, while the spokes were iron rods 2½ in. in diameter, placed in pairs 13 ft. apart at the crown connection. Thirty-six cars were hung on the periphery, each seating 40 passengers. The weight of the wheel and passengers was 1,200 tons. This immense burden was supported by substantial mechanical devices and a solid concrete foundation. The circumference of the wheel was 825 ft.; diameter, 250 ft.; and elevation above the ground, 15 ft., making a total height of 265 ft. It was lighted throughout the exposition season by 3,000 electric lights. The total cost of construction aggregated \$300,000, while the number of passengers carried during the period of operation was 1,454,013. It was taken down at the close of the exposition and erected near Lincoln Park, Chicago, and in 1904 was removed to the exposition in St. Louis. Smaller wheels of the same sort, and known by the same name, continue to be features of amusement parks.

Ferro (*jě'r-ō*), a component of names which describe substances containing iron. It is derived from the Latin *ferrum* meaning iron. Ferro alloys are iron alloys containing such elements as silicon, chromium, nickel, and manganese.

Ferrol (*jě'r-rōl*), a city of Spain, in the province of Coruña, on the Bay of Betanzos, 12 m. N.E. of Coruña. It has a fine harbor and is strongly fortified. The manufactures include hardware, leather, chocolate, cutlery, and firearms. Among the chief buildings are those of the government, a number of churches, and several schools. The streets are wide and regular and are beautified by several squares and promenades. Electric lights and street railways are among the public utilities. Ferrol was made a naval station by Charles III, and still has the largest shipbuilding interests in Spain. The French captured it in 1809 and in 1823. Population, *ca.* 27,500.

Ferro-Uranium (*jě'r-ō-ū-rā-ni-ūm*). See *Uranium*.

Ferry (*jě'r-rŷ*), a passage by boat across a small body or stream of water. Ferryboats ply back and forth across water to carry passengers, horses, vehicles, or any other form of traffic. Any mode of power may be used to propel the boat. Sometimes a pulley is placed over a cable stretched from bank to bank and the action of the water in a running stream carries it across. Large ferries are propelled by steam and furnish transportation for several thousand passengers, as those operated in New York City across the Hudson and the upper bay. In some cases entire trains are transported by steam ferry, as across Hampton Roads, the Columbia River, and the Straits of Mackinac.

Ferry (*jě-rě'*), JULES FRANÇOIS CAMILLE, statesman, born in St-Dié, France, Apr. 5, 1832; died Mar. 7, 1893. He was admitted to the Paris bar in 1854, and soon afterward identified himself with the opponents of the empire. In 1865 he secured an election to the legislature, opposed the war with Prussia in that body, and assisted in suppressing the Commune in 1870. After the establishment of the republic, he became minister to Athens and in 1879 was made minister of public instruction. When the ministry dissolved in 1880, it devolved upon him to form a cabinet, which soon after adopted a policy of colonial expansion, but he resigned in 1881 as a result of dissensions regarding the military contentions in Tunis. In 1883 he was again made premier, but his ministry was overthrown in 1884 by an adverse vote in relation to the war with China. The defeat of the French troops in Tonquin made him unpopular, and he withdrew into retirement until

1893, when he was recalled to public life on account of the Panama Canal excitement. His death occurred shortly after his election to the presidency of the senate.

Fertility (*jě-r-til'i-tē*), the ability to reproduce. Some biologists believe that fertility is influenced by certain genes (see *Gene*). Prolific childbearing, which characterizes certain human strains, is thought to have some hereditary basis, just as the number of offspring in a litter or the frequency of reproduction among various species is apparently genetically controlled. No excess-fertility genes, however, have yet been identified. See *Sterility*.

Fertilization (*jě-r-til-zā'shòn*), in biology, the union of an egg and sperm to produce offspring, occurring commonly only in the case of closely related organisms having similar germ cells and genetic systems. Very diverse organisms, such as mollusks and echinoderms, or star-

FERTILIZATION

1 Egg develops in ovary.



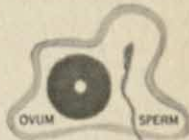
2 Released egg drawn into fallopian tube.



4 Millions of male sperm cells enter uterus.



6 Egg embeds itself in lining of uterus and begins to grow.



THE OVUM OR EGG CELL IS JUST VISIBLE TO THE NAKED EYE. THE SPERM CELL CAN BE SEEN ONLY UNDER A MICROSCOPE.

3 Egg travels down tube toward uterus.



5 In tube one sperm cell fertilizes egg.

When fertilization does not take place, the egg cell and the thick spongy lining of the uterus pass out of the body. This is called menstruation.

fish and sea urchins, differing greatly in their chromosomes or in other features of the germ cells, do not cross. When the sperm of one such type is brought into contact with the ova of another, the sperm does not enter the ova and there is no fertilization. In botany, fertilization refers to the pollination of plants. See also *Fetus*.

Fertilizers (*fēr'ū-lī-zērz*), the general name of substances that are used to enrich the soil and promote the growth of plants. It is common to distinguish between natural and commercial fertilizers, the former being known as *manure* and the latter as *fertilizers*. In a restricted sense the latter applies only to the materials that pass through some process of manufacture before being utilized in farming or gardening. They include such inorganic materials as nitrate of soda, sulphate and chloride of potash, and variously prepared forms of phosphate rock, and such organic substances as guano, bone dust, and the refuse from slaughterhouses. Manures contain certain natural growth-promoting substances called "auxins," in addition to potash, phosphorus, and nitrogen.

Stable manures are usually spread on the ground and plowed under, while commercial fertilizers are drilled into the soil in connection with wheat, corn, rye, and other grains, and in this way the plant food comes in direct contact with the roots of the growing plants. The manufacture of commercial fertilizers is regulated by law in many States and provinces, requiring in most countries supervision under the State or government, and the different classes are tested and graduated on the basis of their utility as plant food. This is quite necessary, since the agriculturalists otherwise would be unprotected against the use of worthless or harmful materials. See *Manure*.

Fessenden (*fēs'en-dēn*), WILLIAM PITT, statesman, born in Boscawen, N.H., Oct. 16, 1806; died at Portland, Me., Sept. 8, 1869. After obtaining a legal education, he entered practice in Maine and in 1832 was elected as a Whig to the legislature, where he served a number of terms. The Free-Soil democrats and Whigs elected him to the U.S. Senate in 1854, and he served in that body for two terms. He became a prominent factor in organizing the Republican party, opposed the Kansas-Nebraska bill, and attended the peace convention in 1861. In 1864 he succeeded Salmon P. Chase as Sec. of the Treasury, which post he resigned the following year to re-enter the Senate. During his last term he was chairman of the joint committee on reconstruction and of the finance committee. Fessenden opposed the impeachment of Andrew Johnson, and was one of the seven Republican senators who voted against conviction after the trial by the Senate.

Festivals (*fēs'ti-valz*), or *FEASTS*, a period of

one or more days consecrated to commemorate some important event or the observance of some religious rite. Festivals were held by most ancient nations and have continued to be observed throughout the modern centuries, though in a modified form. At the time Homer wrote the "Iliad" it was customary among the Greeks to keep two principal festivals—those of the harvest and the vintage—in which the deities were borne through the assemblages, animals were sacrificed, and the sounds of music rent the air. The six sacred festivals of the Jews are enumerated in Leviticus 23. The ancient Greeks celebrated the festivals of Dionysia and Eleusinia and the Pythian, Olympic, Nemean, and Isthmian games, the four last mentioned constituting their great national games. Many festivals were celebrated in ancient Rome, but the Cerealia, Lupercalia, and Saturnalia constituted the more important. Many of the civil festivals of the Romans and Greeks were similar in that they consisted of warlike games and exercises.

The festivals kept by the Christians give distinct reference to Christ and other personages held important in the history of the church. Formerly such a festival was known as a *holy day*, hence the name *holiday*. The observance of Sunday is of most frequent occurrence. Other festivals designated in the Christian calendar have reference to events in the life of Christ, such as Christmas, Annunciation, Purification, Easter, Ascension, Corpus Christi, Epiphany, Transfiguration, and Trinity. Numerous festivals are set apart to commemorate saints, apostles, and angels, though in most of the churches every day of the year is dedicated to some personage or event. The term *holiday* at present has particular reference to the days set apart by the government to commemorate some important personage or event. See *Holiday*.

Festus (*fēs'tūs*), PORCIUS, the Roman governor of Judaea under Nero in 61-62 A.D., who succeeded Felix. The apostle Paul appeared before him as a prisoner, and, after hearing his remarkable plea, Festus manifested a disposition to set him free, but Paul appealed to Caesar and was accordingly sent to Rome.

Fetish (*fē'tish*), or *FETICH*, a word introduced by Charles de Brosses (1709-77) in 1760 in his publication, "Du Culte des dieux fétiches." It was derived from the Portuguese word *feitiço*, meaning *magic*, a term which expresses the idea held by the Portuguese concerning the religion of the natives found in Western Africa. The name was applied by Comte in a general way to the primitive theories of religion, but Sir John Lubbock assigns it as the second stage in the evolution of religious thought, rather than as a form of religion. He takes this view for the reason that the idea in worship is not necessarily involved,

since primitive people believe that deities can be compelled to comply with their desires by means of a fetish.

Fetishism (*fě'tish-iz'm*), or FETICHISM, a word whose various meanings may be reduced to two basic concepts: 1) A kind of primitive religious system which culminates in the worship of inanimate objects, very often connected with the belief that certain objects are inhabited by spirits and that such objects are charms which derive their magical power from those spirits. Portuguese discoverers in the 15th century, writing about the religious customs of West Africa, first introduced the word fetishism with reference to the African natives. Many people still believe erroneously that it is connected exclusively with Negro tribes, but almost all primitive religions show traces of faith in the magical qualities of specific objects, which thus become fetishes. Even the most highly developed religious systems, such as Judaism and Christianity, sometimes touch dangerously on this concept. This may occur when an object originally meant as a religious symbol is credited with magical powers in its material form. For example, when the earth of a specific country is strewn over a coffin on the occasion of burial, the material substance of the symbol is used because some magical qualities are attributed to it. 2) The second meaning of the word fetishism concerns relations between human beings. Inanimate objects are again kept and esteemed because they are believed to have some magical quality. In this case, of course, no one believes that spirits inhabit the objects. The flower given by the girl to her lover, or any object formerly possessed by a venerated personality is held dear not because of subjective personal associations, but because of supposed objective magic qualities. The next step is sexual fetishism, a form of sexual perversion (e.g., collecting of wearing apparel of the beloved) which became the object of special studies through the influence of Freud and modern psychoanalysts and others.

There are various forms of fetishism ranging from the belief that a charm may be magically active because of the power of an inhabiting spirit to the belief that specific blessings or curses can give magic qualities to individual objects. In the latter case, the objects can act or be acted upon magically; things done to them have a magical influence on human beings. Often, animate subjects, such as animals, are also considered fetishes. See *Idol; Magic; Taboo; Totem*.

Fetus (*fě'tús*), or FOETUS, in medicine, term generally applied to the embryo, more especially to the embryo after the end of the fourth month of pregnancy, when typical human traits can first be distinguished. See *Embryology; Evolution; Fertilization*.

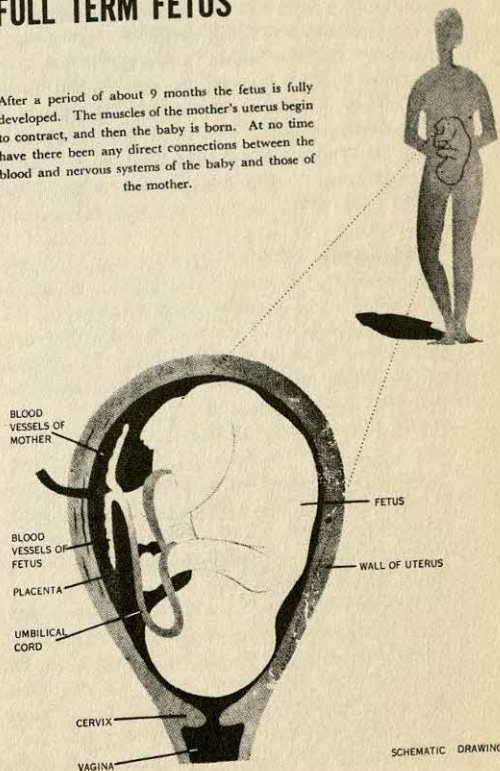
Feuchtwanger (*foikf'väng-ēr*), LION, writer,

born in Munich, July 7, 1884; died in Los Angeles, Calif., Dec. 21, 1958. He studied at the Univ. of Berlin, then went to Munich. After the rise of the National Socialists forced him into exile, he came to the U.S. in 1940. He wrote dramas, then novels, including "Jud Süß" ("Power," 1926), "The Ugly Duchess" (1928), "Proud Destiny" (1947), "This is the Hour" (1951), "Tis Folly to be Wise" (1953), "Raquel, the Jewess of Toledo" (1956), and "Jephta and His Daughter" (1958).

Feudal System (*fū'dəl*), an economic system or condition in force throughout Europe for many centuries. It was distinguished by the political and social ranks which were based on the tenure of feuds and fiefs, given as compensation for military service rendered by chiefs. Under these owners the land was sublet by allotment to their subordinates and vassals in consideration of like service to be rendered. According to the feudal system, the king was the owner of all the land in his dominion, while noblemen held certain tracts under grants from him at his pleasure, but usually on condition of military service. When the Teutonic conquerors of the Roman Empire acquired paramount power, the feudal system made it possible for them to hold possession under the influence of noblemen, who were personally benefited. It had spread over all

FULL TERM FETUS

After a period of about 9 months the fetus is fully developed. The muscles of the mother's uterus begin to contract, and then the baby is born. At no time have there been any direct connections between the blood and nervous systems of the baby and those of the mother.



of France and Germany by the time William the Conqueror led his expedition into England, and soon after all the land was seized and a feudal system was established. It prevailed in England in a widespread form until the restoration of Charles II. However, traces of it are still abundant, but the conditions are greatly modified.

The people of England, who had acquired absolute possession under the Angles and Saxons, universally opposed the establishment of feudal ownership. Here the lands were said to be *allodial* to distinguish them from the *feudal* lands. Later both classes of ownership were recognized, the allodial estates being held by the noble and ordinary freemen and the feudal by those who were bound to serve some superior lord. The latter system possessed some advantage in that it furnished greater security of life and property and hence came to predominate as a matter of necessity. Even the minor nobles who owned estates voluntarily placed themselves for protection under some more powerful earl or duke, a practice which gradually gave rise to the powerful principalities of Germany and the whole continent.

The feudal system began to crumble with the rise of learning. Other causes of its decline include the spread of civilization, a wider knowledge of the rights of citizens, the rise of cities, and a change in the modes of warfare. Traces more or less prominent are still found in some countries, such as landowners holding title only as tenants from lords or titled nobles. On the banks of the Rhine and in many regions of Germanic and Romanic countries are remains of the system, such as castles formerly occupied by feudal barons and numerous villages in which dependents were grouped for religious worship and educational instruction.

Feuerbach (*foi'ër-bāk*), ANSELM, painter, born in Spire, Germany, Sept. 12, 1829; died in Venice, Italy, Jan. 4, 1880. Son of the jurist, P.J. Feuerbach, he showed interest in art at an early age, and studied under F.W. Schadow in Düsseldorf and later in Munich. He resided in Paris, Karlsruhe, and Rome, and accepted a professorship at the academy in Vienna in 1873, from which he, however, resigned three years later. Well known for his historical paintings and portraits, his fame rests chiefly on his beautiful interpretation of "Iphigenia in Tauris," which he finished in 1871. He also left behind an autobiography, "Ein Vermaechtnis."

Feuerbach, LUDWIG ANDREAS, philosopher, son of Paul J.A. Feuerbach, born in Landshut, Germany, July 27, 1804; died Sept. 13, 1872. He first studied at Heidelberg and later at Berlin under Hegel. In 1828 he secured a professorship in the Univ. of Erlangen, but after a few years devoted all his time to literary work. His teach-

ings contend against immortality, and hold that truth can be ascertained only by the senses coming in touch with things. Among his best-known works are: "The Essence of Religion," "Thoughts Regarding Life and Death," "Godhead, Freedom and Immortality," and "The Essence of Christianity." The last-mentioned book was translated by George Eliot in 1854.

Feuerbach, PAUL JOHANN ANSELM, distinguished criminal jurist, born in Jena, Germany, Nov. 13, 1775; died May 25, 1833. He was graduated from the law course of the Univ. of Jena, practiced law, and later accepted the chair of jurisprudence at Jena and subsequently at Kiel. In 1804 he was made professor of criminal law in the Univ. of Landshut, and soon after drew a criminal code for Bavaria. He became second president of the court of appeals at Bamberg in 1814, and three years later was made first president of the appeal court at Anspach. Among his publications are: "On the Crime of High Treason," "Remarkable Criminal Trials," and "Contributions to the Art of Law Making."

Feuerman (*foi'ër-män*), EMANUEL, cellist, born in Kolomea, Galicia, Austria, Nov. 22, 1902; died in New York, N.Y., May 25, 1942. He studied in Vienna with Anton Walter, and at the age of 11 he appeared as soloist with the Vienna Symphony under Felix von Weingartner. He taught (1917-23) at the Cologne Conservatory of Music and then toured Europe for many years. He held a professorship at the Hochschule für Musik in Berlin, 1930-33. To escape the Hitler government in Germany, he moved to Vienna in 1934 and the next year made his American debut with the New York Philharmonic-Symphony Orchestra. He gave several concerts in 1936 and in 1938 made his permanent home in the U.S. Internationally famous, he gave annual recitals at Carnegie Hall in New York City and played with most of the major symphony orchestras of the world. He was considered one of the most distinguished of cellists.

Feuillant (*fú-yän*), a member of a political club established (1791) during the French Revolution by the right wing of the Jacobin club. The members called themselves the "Society of the Friends of the Constitution" but received their popular name from the former Feuillant convent where they met. Supporting the Constitution of 1791 and a constitutional monarchy, they were suppressed by the Jacobins after the fall of the monarchy in September 1792. "Feuillant" was later used to characterize a cowardly moderate.

Feuille (*fú-yé'*), OCTAVE, novelist and dramatist, born in St.-Lô, France, Aug. 11, 1821; died in Paris, Dec. 29, 1890. He studied at Paris and for some time was a literary assistant to Dumas *père*. Later he became a playwright (frequently in collaboration with Paul Bocage) and

novelist; and, in the meantime, contributed to various newspapers and periodicals. In 1862 he was elected to the French Acad. Among his writings are "The Little Countess" (1857); "The Romance of a Poor Young Man" (1858), which he also adapted into a successful play; and "Monsieur de Camors" (1867).

Fever (*fē'vēr*), any elevation of body temperature above the normal temperature (in human beings, 98.6° F.); also a disease or group of diseases characterized by an accelerated pulse and increased heat of the skin. Fever usually commences with chills, loss of appetite, and a feeling of lassitude, and it is often accompanied by pains in the back and limbs and nausea. Some of the causes of fever are disease, injury to the nerve center of the brain, dehydration (reduction of water content in the blood), and certain drugs. When the temperature in a high fever exceeds 105° F., it is considered dangerous, although temperature elevation within limits is one of the body's defenses against disease. Fever aids the formation of antibodies which destroy infective organisms. It is sometimes artificially induced for this purpose. Julius Wagner von Jauregg (*q.v.*) was a pioneer in fever therapy and in 1917 used malaria organisms to produce fever in the treatment of general paralysis of the insane. Other microbes have been used, as well as physical procedures, *e.g.*, electrical methods, hot baths, and radiation from infrared and other sources.

Feverfew (*fē'vēr-fū*), the common name of a perennial plant native to Europe, found near hedges and in waste places. A member of the family Compositae, the feverfew (*Chrysanthemum Parthenium*) is allied to the wild chamomile. It has flat leaves and small flowers. The stem has many branches, is 1 ft. to 3 ft. high, and has a strong aromatic smell. The plant was named from its use as a medicine in treating ague and fever. A double flowering species is cultivated in gardens, and a related plant yields the powerful insecticide pyrethrum.

Fez (*fēz*), Arabic, FAS; French, FÈS, a city in Morocco, on the Fez River, about 250 m. N.E. of Marrakech and 85 m. S. of the Mediterranean. Fez is situated in a rich agricultural valley of the Atlas Mts. on a main route between the Atlantic coast and Algiers. It is important commercially and the center of Morocco's native handicrafts—leather and textile products, musical instruments, and ceramics.

The city is made up of three distinct parts—old Fez, which was founded in 808 by Idris II, is a medieval town of narrow alleys and market streets with artisan guilds; new Fez, established in 1276 under the Marinid dynasty, is to the southwest of old Fez and contains the former sultan's palace and the Jewish quarter; and the modern section, south of the railroad station,

which was started in 1916. The last-mentioned district is European in character and contains many residences. Fez is a city of mosques; the Mulai Idris mosque, containing the shrine of Idris II, is one of the holiest places in Morocco. The Karaouine mosque, largest in Africa, was the seat of a Moslem university in the Middle Ages, when Fez was the center of Islamic learning. Fez was long the northern capital of the sultans. The city gave its name to a brimless cap worn by Mohammedan men. Population, 1952, 179,372.

Fezzan (*fē-zān'*), a region of the Sahara Desert in southwestern Libya. It is a plateau ringed by hills and dotted with oases where dates and grain are grown. Situated on the route between the Mediterranean Sea and the Sudan, it became an important caravan stop and was conquered many times—by Rome in 19 B.C., by the Arabs in the 7th century A.D., by Bornu (a former Nigerian state) in the 13th century, by Turkey in 1842, by Italy in 1912, and by the Free French in 1942. It became part of Libya in 1951. Sebha (pop. ca. 7,000) is the seat of administration, and Murzuk is an important settlement. Population, ca. 55,000.

Fianna Fail (*fē'a-nā fāl*), an Irish political party organized by Eamon De Valera (*q.v.*) in 1926. An offshoot of Sinn Féin (*q.v.*), it was formed in protest to the Anglo-Irish treaty of 1921 which established the Irish Free State; and it pursued a policy of complete political separation from England. The party has been in control of the Irish government for the most part since 1932. See also *Fenians; Ireland*.

Fiat Money (*fī'āt mūn'ē*), the name applied to money which is issued by a government but contains no promise of redemption and is not based upon specie. In 1862 the Union government was authorized to issue fiat money, called greenbacks, to finance the Civil War, and they were made redeemable by the Specie Resumption Act of 1875. More recently, such money was issued in large quantities after World War I by Austria, Germany, and other European countries. See also *Assignats; Inflation*.

Fiber (*fī'bēr*) or FIBRE, a threadlike strand or filament of animal, vegetable, inorganic, or synthetic (see *Plastics*) origin. Fibers can be woven into textiles, made into ropes, twines, cords, and felts, and incorporated in paper, stuffing for furniture, mats, and brushes. Among the common animal fibers are silk, wool, mohair, alpaca, vicuña, camel, horse, rabbit, beaver, hog, badger, and sable. Animal fibers are mainly protein. Among the common vegetable fibers are cotton, flax, hemp, sisal, Spanish moss, jute, palmyra, rushes, and kapok. All vegetable fibers are essentially cellulose. Asbestos is the major natural inorganic fiber, but in recent years glass has found wide acceptance in various spun and

extruded forms. Metals such as silver, gold, aluminum, and stainless steel are also drawn to very fine form and woven into cloth for special uses or combined with other fibers for decorative effects. Wool, flax, and hemp have been used in textiles and cordage since ancient times, and cotton (the fiber still used in greatest quantity) provided clothing for China, India, and Egypt long before the Christian era. Silk, obtained commercially from the mulberry silkworm (*Bombyx mori*), is said to have been woven into cloth in China as early as 2640 B.C.

Fibers are made into textiles by winding and twisting (silk); combing, scutching, or hacking to produce free parallel members, which are put together and drawn or twisted into yarns (cotton, flax, wool); or gathered together, dry or wet, to produce tissues and felts (rabbit, flax, wool). In recent years fibers have been blended to produce cloth of a particular "hand" or for a special use. This is true especially of the new synthetics, which are often blended with cotton or wool to achieve a desired suiting. See also separate articles on individual textiles.

Fibiger (fĭ'bĕ-gĕr), JOHANNES ANDREAS, pathologist, born in Silkeborg, Denmark, April 23, 1867; died in Copenhagen, Jan. 30, 1928. He received his Ph.D. degree in 1895 from the Univ. of Copenhagen and two years later joined the staff of the Inst. of Pathological Anatomy in Copenhagen, becoming head of the institute in 1900. Fibiger became known for his cancer research and in 1907 discovered the *Spiroptera carcinoma*, a parasite which produces cancer artificially. His final report on the parasite, made in 1913, marks the beginning of successful studies of artificially produced cancer. He was awarded the Nobel Prize for medicine and physiology in 1926.

Fibonacci (fĭ-bō-nā'chĕ), LEONARDO, a variant form of Leonardo da Pisa (q.v.).

Fibrin (fĭ'brĭn), a white proteid compound obtained when blood is coagulated, as by stirring fresh blood with a bundle of twigs. The fibrin, adhering in fibrous layers, is washed with water to remove the coloring matter. It is insoluble in water, but dissolves in an aqueous solution of nitrate of potassium when heated to 40° F. Normal human blood contains 2.55 per cent of fibrin. Vegetable fibrin is a nitrogenous substance resembling animal fibrin, and is separated from the seeds of cereals and other plants.

Fibula (fĭb'ū-lā), a Latin word meaning clasp, buckle, pin, or brace, used in archeology to designate a clasp or brooch found among antique remains. See *Brooch*.

Fichte (fĭk'tĕ), JOHANN GOTTLIEB, philosopher, born in Rammenau, Germany, May 19, 1762; died in Berlin, Jan. 27, 1814. He was the son of a pious, upright family in modest circumstances. By

chance, a neighboring nobleman observed his outstanding mental abilities and financed his early education, placing him in charge of Pastor Krebel in Niederau and later at the famous school of Pforta. In 1780, Fichte entered the Univ. of Jena to study theology and philosophy, supporting himself by private tutoring. In 1790 he settled in Leipzig, where he married Johanna Maria Rahn, a niece of the poet, Klopstock. About this time, he came to the attention of Kant, and the two became close friends. Fichte held the chair of philosophy at Jena and later at Erlangen. In 1807 he was appointed by the king to prepare a constitution for a university in Berlin and when that institution was founded became its first rector. In addition to his philosophical writings, he delivered many lectures and made public speeches to further the movement for German national independence and unity.

The achievements of Fichte did not lead to the founding of a distinct school of philosophy, but his teachings and writings have influenced the educational aspect of all civilized peoples. The importance of Fichte's philosophy lies in the further development of the ideas of Kant, by whom he was greatly influenced.

Having finished his own studies, Fichte went to see Kant in Königsberg and wrote his "Critique of Revelation" (1792), first thought to be a work by Kant himself. Later on, he changed his attitude toward some basic concepts of Kant's philosophy. Fichte's work also shows the influence of Spinoza. Like Kant, he believed that we who are able to perceive the external world, to recognize it, and to think about it, are the real creators. We can perceive only in the form of time and space. This means that we automatically arrange our impressions from outside one after the other in

JOHANN FICHTE

Courtesy Bettmann Archive, N. Y.



time (chronologically), and one beside the other (in space). The individual objects of the external world, which appear to us to have distinctive forms, are of value only as stimuli to our perception. We do not know anything about their real quality—the *Ding an sich*, or the object proper.

Fichte now begins to depart from the philosophy of Kant. Kant believed that the outside objects are the cause of our sensations and impressions; therefore, they must exist, even if we are unable to know anything of their real qualities. Fichte goes farther. He declares that there is no proof that our personal sensations are caused by any outside world. In other words, the factor of reality in our knowledge is not provable, and it is possible that our sensations and emotions are entirely subjective; that is, not based on any external existence. Thus far, Fichte is more idealistic than Kant, since for him reality is only a possibility, perhaps even produced by our own consciousness. In this deduction, Fichte is not too far away from the concept of Spinoza, who expresses similar thoughts when he states the unity of substance. Out of his basic philosophy, Fichte developed a certain moral philosophy which was to exert a great influence on the educational development of all countries in the 19th century. The complete subjectivation of our consciousness creates a transcendental attitude, since everything refers only to our consciousness. Out of this complicated philosophy developed transcendentalism (*q.v.*), which had an important influence on the spiritual life of this country. Perfection of the ego is the final purpose of our existence, since the reality of the world is not known but only believed. Duty and moral order are in us, not supposedly but actually. "The moral order is God."

The influence of Fichte's philosophy on German philosophers of the 19th century was tremendous. It even contributed to the spiritual stimulus of the movement which finally led to the German war of liberation from Napoleon. Carlyle and Emerson, in England and America, are among the writers and philosophers in other countries who were basically influenced by Fichte's philosophy.

In addition to the "Critique of Revelation," Fichte wrote: "The Nature of the Scholar," "The Vocation of Man," "The Way to a Blessed Life," "Characteristics of the Present Age," "The Vocation of the Scholar," "Our Belief in a Divine Government of the Universe," and "Introduction of the Theory of Science."

Fichtelgebirge (*fīk'tel-ge-bīr-ge*), a mountain range of Germany, on the northern frontier of Bavaria, about midway between the Bohmer Wald and the Erzgebirge. It has a general elevation of 3,000 ft., but Schneeberg, the highest peak, is 3,415 ft. above the sea. This range of mountains separates the affluents of the North Sea and

the Black Sea, being the source of the Naab, the Main, the Saale, and the Eger. Much of the surface is covered with fir and pine. Copper, lead, and iron ores are mined extensively.

Ficino (*jē-chē'nō*), MARSILIO, physician and philosopher, main representative of the philosophy of the Renaissance (*q.v.*), born in Figline, Italy, Oct. 19, 1433; died in Florence Oct. 1, 1499. He was educated in the court of Cosimo de' Medici and later taught at the Florentine Acad., which Cosimo had founded (1440) as the center of the new humanistic spirit of the Renaissance. In 1476, Ficino was ordained and although he gradually acquired certain ecclesiastical positions, he never played a great role in the Church. His official position in the Church must be emphasized, however, in order to clarify the fact that he did not feel his philosophy to be in contrast to its teachings.

Ficino's system is contained in his *Theologia Platonica de immortalitate animae* (1482). It is of interest to us less for philosophical reasons than as a typical product of the Renaissance period. It represents a rather elaborate system of the universe, climaxing in God, with the human body as the lowest unity. Its hierarchical structure is still reminiscent of medieval forms of thinking but the emphasis on Plato (*q.v.*), in contrast to Aristotle, is typical of Renaissance scholars. All of Ficino's arguments for the immortality of the soul are taken from Plato and the Neo-Platonists (*q.v.*). He even tried to prove Plato to be the forerunner of Christianity. He turned certain Neo-Platonic ideas into astrological and dietetic formulas, an approach which showed the influence of his being a physician on his method of thinking.

Through his work, with which he combined excellent translations of Plato and Plotinus into Latin, he influenced his contemporaries greatly and his idea of "Platonic love" had about the same influence on the literature of his time as the ideas of Freud have had on modern literature.

Fiddler Crab (*fīd'lēr krāb*), a small crab living in countless numbers on the east coast of the U.S., south of Cape Cod, the Gulf of Mexico, and the West Indies. Its largest species is recognized by a red patch at the joints of the legs. They burrow holes into sand beaches and embankments, often causing serious damage.

Fidelio (*fī-dā'lī-ō*), only opera composed by Ludwig van Beethoven (*q.v.*). First produced in Vienna, Austria, under the title of "Leonore," in 1805, it proved a failure. After reworking both score and libretto, the three-act opera, then called by its present name "Fidelio," was again performed in Vienna with immediate success. It was first performed in New York in 1839. Among the three different overtures Beethoven wrote for this opera, "Leonore Overture No. 3" is the most famous.

Fiduciary (fī-dū'shī-ēr-y), financial term for a person or organization acting in a position of trust as representative of another. Also used in connection with the issuance of coinage or currency the security of which rests upon faith.

Fiedler (fēd'ēr), ARTHUR, conductor, born in Boston, Mass., Dec. 17, 1894. After studying at the Royal Acad. of Music, Berlin, he began a musical career in the U.S. that has included membership (as violinist) in the Boston Symphony Orchestra since 1915, and organization of the Boston Sinfonietta (1927), and the free outdoor Esplanade Concerts in the same city (1929). He has conducted the Boston "Pops" Orchestra since 1930 as well as several choral societies.

Field Artillery (fēld ār-tīl'ēr-y). See *Cannon*.

Field (fēld), CYRUS WEST, merchant and scientist, born in Stockbridge, Mass., Nov. 30, 1819; died in New York City, July 12, 1892. After attending public schools, he went to New York City, where he obtained a position as clerk in a dry goods store at a small salary. In 1840 he established himself as a paper manufacturer. He retired from business in 1853, traveled in South America, and, on his return the following year, began to study oceanic telegraphs. After numerous unsuccessful attempts, he finally succeeded in obtaining a charter for a telegraph line from New York City to Europe by way of Newfoundland. He devoted 13 years to this enterprise, in enlisting interest and having the work done, and meanwhile crossed the Atlantic 50 times.

The telegraph line to Newfoundland was the first to be completed, receiving his personal supervision, and in 1857-58 he accompanied the expedition to lay the cable in the Atlantic Ocean from Newfoundland to Europe. The enterprise was consummated with entire satisfaction in July 1866. In laying the cable, the *Great Eastern*, then the largest vessel afloat, was used. Congress voted him a gold medal for his achievement and he received various decorations from several European countries. Communication between the two continents has never been interrupted since this line was completed. Later he promoted the construction of the elevated railroads in New York City. He erected a monument to the memory of Major John André at Tarrytown, N.Y., but it was subsequently destroyed by people who were prejudiced against Major André. His faithful life-work was recognized by the civilized world, but financial embarrassments embittered his closing years.

Field, DAVID DUDLEY, jurist, born at Haddam, Conn., Feb. 13, 1805; died Apr. 13, 1894. He studied at Williams Coll., was admitted to the bar in 1828, and took up the practice of law in New York City. In 1847 he was made a commissioner on practice and pleadings, and the legislature enacted as a law the work reported

by the commissioner, entitled "Codes of Civil and Criminal Procedure." Later he was made the head of a commission to prepare a political code, a civil code, and a penal code, and these were completed in 1865. His greatest work is entitled "Outlines of an International Code," which was translated into Chinese and several European languages, and was the basis of reforms in codifying the laws of several nations. In 1876 he was elected to Congress as a Democrat. Among his later publications are "The Electoral Votes of 1876" and "Speeches and Arguments Before the Supreme Court of the U.S."

Field, EUGENE, journalist and poet, born in St. Louis, Mo., Sept. 3, 1850; died in Chicago, Nov. 4, 1895. He entered Williams Coll. in 1868 and later attended Knox Coll., Galesburg, Ill., and the Univ. of Missouri. After traveling abroad, he engaged in newspaper work in 1873 with the *St. Louis Journal*. Later he held editorial positions on papers published at St. Joseph, St. Louis, Kansas City, Denver, and Chicago. In connection with the *Chicago Morning News*, later the *Record-Herald*, appeared his best journalistic work, in a column called "Sharps and Flats." As a platform reader of his own productions he stood in high repute, and while preparing for a trip of this kind he died quite suddenly. Eugene Field, as a joker, was practical, bold, and showed a spirit of enjoyment that made him universally popular. Among his productions for children are: "Little Boy Blue," "Seein' Things," "Jes' 'Fore Christmas," and "Wynken, Blynken, and Nod." These writings caused him to be styled the "Poet Laureate of the Children." His best known published works include: "The Second Book of Verse," "Love Songs of Childhood," "Echoes from the Sabine Farm," "A Little Book of Western Verse," "The Gradual Rise of Literature in Chicago," and "A Book of Profitable Tales." The most delicately humorous essays of Field are contained in "The Love Affairs of a Bibliomaniac," and his best verses for children are in "With Trumpet and Drum."

Field, MARSHALL, businessman, born near Conway, Mass., Aug. 18, 1834; died in New York City, Jan. 16, 1906. As a young man, he was a clerk in Pittsfield, Mass., and in 1856 he went to Chicago to work in a wholesale dry goods establishment, becoming a partner there in 1862. In 1865 he joined the firm of Field, Palmer & Leiter. Potter Palmer retired from the firm in 1867, and Levi Z. Leiter retired in 1881; the company was subsequently reorganized as Marshall Field & Co., developing into the largest retail and wholesale business of its kind in the world. It maintained headquarters in Chicago and set up branch offices in Europe. From the fortune he amassed, Field gave the Univ. of Chicago real estate for its site, with a sum of money. He made a gift of \$1,000,000 to the Col-

umbian Museum at the Chicago World's Fair of 1893, which was renamed the Field Museum of Natural History and relocated later. By will, he also left the institution another \$8,000,000.

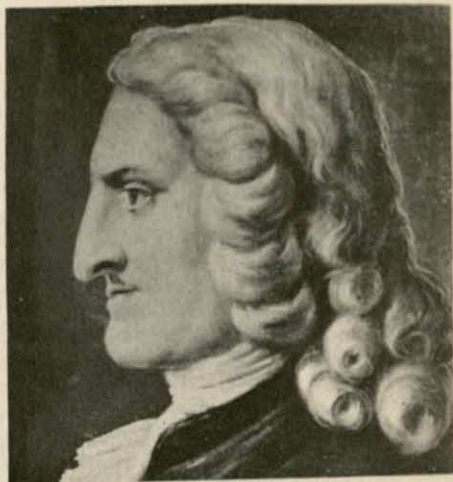
Field, MARSHALL, III, businessman and philanthropist, born in Chicago, Sept. 28, 1893; died in New York City, Nov. 8, 1956. Grandson of Marshall Field (*q.v.*), he was educated at Eton and at Cambridge Univ., England. He served in World War I, enlisting as a private and advancing to captain in the artillery. A stock broker and director of many concerns, he later became interested in a liberal press. He founded the afternoon paper *PM* in New York City in 1940 and the *Chicago Sun* in 1941. The first paper ceased publication in 1948, and Field merged the *Sun* with the *Chicago Daily-Times* about the same time; it was later known as the *Chicago Sun-Times*. Continuing to concentrate on the communications field, he purchased controlling interests in radio stations and in book publishing firms. He particularly hoped to encourage the production of inexpensive books, in paperback editions.

A delegate to the 1944 National Democratic Convention in Chicago, Field reviewed his democratic principles the following year in "Freedom is More than a Word." He devoted much of his inherited fortune to philanthropic purposes.

Field, RACHEL, author, born in New York City, Sept. 19, 1894; died in Los Angeles, Calif., March 15, 1942. Educated at Radcliffe Coll., she distinguished herself not only in the field of children's literature, but also as a novelist and poet. In 1929 she received the John Newbery medal for her outstanding children's book, "Hitty: Her First Hundred Years." Other books included "Calico Bush" (1931), also for children; "Branches Green" (1934), a collection of verse; and the adult novels "Time Out of Mind" (1935), "All This, and Heaven Too" (1938), which was later a successful film, and her last, "And Now Tomorrow" (1942).

Field, STEPHEN JOHNSON, jurist, born in Hadam, Conn., Nov. 4, 1816; died in Washington, D.C., April 9, 1899. The brother of Cyrus West Field and David Dudley Field (*qq.v.*), he was graduated from Williams Coll. in 1837 and went to New York City to study law in his brother David's office. In 1849 he settled in California. Elected (1850) to the state legislature, he became a state supreme court judge in 1857, chief justice in 1859, and an Associate Justice of the U.S. Supreme Court in 1863. He took part in the drafting of California law. As a member of the electoral commission appointed to decide the Presidential election of 1876, he voted for Tilden. During his unprecedented 34 and a half years on the Federal bench, Field was noted for firm adherence to the doctrine of the separation of state and national powers and to the belief that the Federal govern-

ment should protect the natural rights of the citizen. His many dissenting opinions included an important interpretation of the 14th Amendment to the Constitution. His work in California was probably most important, particularly his recognition of the validity of miners' customs in cases involving mining claims, a position significant in later U.S. mining law. Field, who was asked to resign (1897) from the Supreme Court because of his advanced age, discussed his colorful political career in "Reminiscences of Early Days in California" (1877).



Courtesy Brown Brothers

HENRY FIELDING

Fielding (fēld'ing), HENRY, novelist, born in Sharpsham Park, England, April 22, 1707; died in Lisbon, Portugal, Oct. 8, 1754. He was a successful writer of comedies and farces, including "Tom Thumb" (1730), until his sharp satire ("Pasquin," 1735) caused the Walpole government to close his theater in 1737. Fielding turned then to law but continued to write essays. "Joseph Andrews," an hilarious satire on Richardson's "Pamela," started Fielding as a novelist in 1742. His best known novel, "Tom Jones" (1749), is one of the classics of world fiction. He also wrote "Amelia" (1752), among other books, and his work exerted a great influence in determining the form of the English novel.

Approaching life with honest rationality, Fielding found much to laugh at in the hypocrisies and sentimentalities of his day. His realism is flavored with a hearty zest for life.

Field Marshal (fēld mār'shal), highest ranking officer in many European armies. In the British army, the rank of field marshal is conferred only as a special honor or reward.

Field of the Cloth of Gold (fēld òv thē klòth òv gòld), the name of the place where

Francis I of France and Henry VIII of England met from June 7 until 20, 1520, for an interview. The locality of the meeting is on a plain between Arde and Guisnes in the department of Pas-de-Calais. It was so named from the splendor of the banquets and the gorgeous trappings and apparel used by the participants. The meeting occurred because Francis I sought the friendship of Henry VIII against Charles V of Germany, but in this he was not successful. Interviews took place shortly after at Calais and Gravelines between Henry VIII and Charles V. Shakespeare gives a graphic description of the meeting on the Field of the Cloth of Gold in his "Henry VIII."

Fields (*jěldz*), GRACIE, actress, born in Rochdale, Lancashire, England, Jan. 9, 1898. Of poor, working-class parents, she had only a primary education and at the age of 12 was doing her own comic number with a troupe of actors. Her first big role in a revue, "Yes, I Think So," in Manchester, England (1915), was followed by a succession of musical comedy parts which led to her great popularity on the London stage. The fields of moving pictures, radio, and phonograph have enthusiastically welcomed the "Lancashire Lass" with her broad accent, truly good voice, and cheery informality. In 1940, she came to the U.S. where she has continued as a popular entertainer and movie actress ("Holy Matrimony," 1943).

Fields, JAMES THOMAS, author and publisher, born at Portsmouth, N.H., Dec. 31, 1817; died Apr. 24, 1881. He attended the public schools in his native town and in 1834 removed to Boston, where he engaged in publishing. For a number of years he edited the *Atlantic Monthly* and he was the publisher of Holmes, Emerson, Longfellow, Lowell, Hawthorne, and Whittier. After 1870 he devoted his time almost exclusively to lecturing and writing. His books include: "Yesterdays with Authors," "In and Out of Doors With Charles Dickens," "A Few Verses," and "Ballads and Other Verses."

Field Shooting (*jěld shōō'ting*). See *Shooting*.

Fiene (*jě'ne*), ERNEST, painter, born in Elberfeld, Germany, Nov. 2, 1894. He migrated to America in 1912 and became a citizen in 1927. He studied at the National Acad. of Design (1914-18), the Beaux Arts (1916-18), and the Art Students League (1923). Noted principally for his landscapes and portraits, he was awarded a Guggenheim Fellowship (1932), in 1937 the Norman Wait Harris Prize for his oil painting, "Frosty Morning," and in 1940 the Ada S. Garrett prize for his work, "Razing the New York Post Office." His oil painting, "Dyckman Street Church," hangs in the Library of Congress while "Brooklyn Bridge," also an oil, hangs in the New York Public Library.

Fiery Cross (*fī'ěr-ý krōç*), a cross made by the Highlanders of Scotland, who called it the *Cran-*



ERNEST FIENE

Self-portrait

tara. It was constructed of light, dry wood and the extremities were burned to a char, after which the fire was extinguished by dipping in the blood of a goat. The fiery cross was carried from place to place as a signal for men to hasten to arms in defense of their country. A form of the fiery cross is used by the Ku Klux Klan.

Fiesole (*fjě'zô-lā*), GIOVANNI DA (known as FRA ANGELICO), painter, born in Vicchio, Tuscany, 1387; died in Rome, 1455. A Dominican friar, living in Florence and Crotona, he was one of the great masters of the early Renaissance, but was a man of such deep piety that he painted only religious subjects such as saints or angels, the Last Judgment, and the Annunciation. Among his works are frescoes in the convent of San Marco (Florence), San Domenico (Fiesole), and the cathedral of Orvieto.

Fife (*fif*), a small, shrill-toned, martial instrument, either of wood or metal, in the form of a tube, with fingerholes and a blowhole or mouthpiece. It is variously pitched, usually from D on the fourth line of the treble staff upward, and the compass is two octaves. The notes are shrill and somewhat harsh. Fifes and drums have been a source of much inspiration in armies and are still held in high esteem.

Fifteen Decisive Battles (*fif-tēn' dē-sī'siv bāt'lz*). See *Battle*.

Fifth Column (*fifth kōl'ūm*), a term for enemy sympathizers working behind the lines under attack, particularly for fascists inside anti-fascist territory. The term derives from a statement made (1936) by Gen. Mola, one of Gen. Franco's associates in the Spanish Civil War, asserting that the Franco forces had four columns advancing on Madrid and a "fifth column" of sympathizers inside Madrid to attack its de-

fenders within. The term was popularized in this country by the play of the same name by Ernest Hemingway (1938).

Fifty-four Forty or Fight (*fif'ty-jôr jôr'ty*), campaign slogan of the Democratic party in the 1844 Presidential contest, signifying the determination of the U.S. to settle the western border of this country and Canada at 54° 40' N. lat. Although the Democratic candidate, James K. Polk, was elected largely on the strength of this slogan, the boundary was fixed (1846) at 49°.

Fig (*fig*), a small fruit tree native to Asia Minor, but now cultivated in all the countries adjacent to the Mediterranean. About 300 known species are recognized, most of which are characterized by large leaves. Some are trailing vines and others are great trees. The average height of the fig tree grown for its fruit is about 20 ft. In favorable climate it produces two crops of figs yearly, in the spring and autumn. The fruit is a fleshy receptacle of a conical form. It is attached to the twig by the narrow end. At the larger end is a small opening as in a pear, the flower and seeds lining the interior. The fig is used as food and is employed in medicine as a demulcent and laxative. In a fresh state for table use it can be transported only a short distance, hence it is dried extensively and packed in boxes for the market. Dried figs form an important article of commerce, the best grade being imported from Turkey and the Levant. However, the culture of the fig has been extended very largely the past few decades, especially in Australia and California, where the quality of the fruit is thought to be equal to that of Smyrna.

Figaro (*fig'á-rô*), the name of a journal issued in Paris, France, celebrated for publishing contributions from Jules Janin, Jules Sandeau, George Sand, and a number of other able writers. The journal became especially famous through its courageous attitude in the Dreyfus case, in which it supported the defendant (see *Dreyfus, Alfred*). It was so named from a figure in a trilogy of comedies of Beaumarchais, including "The Marriage of Figaro" and "The Barber of Seville." The topic was afterward adapted by Mozart and Rossini, by the former in his "Marriage of Figaro" and by the latter in his "Barber of Seville." Figaro himself is the archetype of the versatile barber, who knows the news and likes to gossip, hence the journal's title.

Fighting Fish (*fit'ing fish*), a small fish allied to the perch family, so named because it is used in captivity for fighting purposes. It is a small fish and is kept in glass globes. The color is dull, when the fish is quiet, but assumes a metallic luster when it becomes excited. Fighting fishes are native to the southeastern part of Asia, where they are used for gambling purposes. They attack each other immediately on coming in contact,

hence much money is spent in betting on the result of the contest.

Fighting Joe (*fit'ing jô*). See *Hooker, Joseph*.
Figures of Speech (*fig'ürz óv spêch*), variations of the literal or ordinary form of expression, the intention being to make the thought more attractive or more striking. The principal figures of speech include the simile, metaphor, allegory, personification, antithesis, synecdoche, apostrophe, hyperbole, climax, and irony. They are usually divided into figures of rhetoric, figures of etymology, and figures of syntax. Figures of *rhetoric* are used extensively in poetical composition, being figures of thought rather than of grammatical form. Figures of *etymology* refer to the forms of words, as in the use of *o'er* instead of *over*, while figures of *syntax* have reference to variations in the construction of sentences.

Simile is an expression of resemblance between two different things, as in the sentence, "Religion is to the soul what life is to nature." *Metaphor* is another figure which is founded upon the resemblance of one thing to another, but it differs from simile in that the expression is implied instead of being formally expressed. "Life is like an isthmus between two eternities" is a simile, while "Life is an isthmus between two eternities" is a metaphor. *Allegory* is founded upon resemblance, but the comparison is more extended than in simile and metaphor. It is designed to teach some abstract truth by the use of symbolic language, hence is in the nature of a short fable or parable. *Personification* consists in attributing life to inanimate things, as in the sentence, "The hungry flames swept onward." *Antithesis* is founded upon unlikeness, in which things are contrasted or opposed to each other. The expression "Science is deep as eternity; speech is shallow as time," is antithetical. *Apostrophe* is direct address to the dead as if they were living, or to the absent as if they were present. A figure of *synecdoche* consists in putting a part for the whole, or the whole for a part, as in the example, "Give us this day our daily bread." *Hyperbole* is an exaggeration, as in saying "I am tired to death." *Climax* is an ascending series of thoughts or statements which gradually increase in importance, as in "Liberty was lost—all was lost!" *Irony* is disguised satire. We make use of this figure when we praise a thing and really mean to ridicule it.

Fiji Islands (*jí'jé*), an island group in the South Pacific Ocean, consisting of about 250 islands, of which one-third are inhabited. They are situated 7,450 m. from San Francisco, E. of the New Hebrides, and have an area of 7,085 sq. m. The two largest are Vanau Levu and Viti Levu, the former having an area of 2,130 sq. m. and the latter, 4,053 sq. m. Most of the islands are of volcanic origin, but the group contains many atolls and coral reefs. Volcanic action and earth-

quakes are not infrequent. The climate is healthful, the soil productive, and most of the natives have become educated and Christianized. Among the principal products are livestock, maize, cotton, copra, sugar, peanuts, tobacco, pearl shells, and fruits. The government maintains 22 public schools and an industrial institute with an enrollment of 200 pupils. The Wesleyan missionaries direct almost entirely the educational affairs, their schools numbering 2,075 with 35,500 pupils. Besides these, there are 145 schools of the Roman Catholic mission, at which 2,150 pupils are enrolled.

The Fiji Islands present one of the most favorable examples of effective Christianization, 110,000 of the inhabitants being Christians, while formerly the natives ranked as the fiercest of cannibals. Abel J. Tasman (1602-59), a Dutch navigator, discovered the islands in 1643, and Captain Cook cruised among them in 1773. An influx of European settlers began in 1866, principally from Australia and New Zealand, and soon after the commercial interests of the Fijis grew to importance. Since 1874 they have been formally governed by Great Britain as the Fiji Colony. Suva, on the south coast of Viti Levu, is the seat of government. The inhabitants consist chiefly of Fijians, Indians, Rotumans, and Europeans, the last mentioned numbering about 2,000. Population, ca. 200,000.

File (*fil*), a steel instrument for abrading or smoothing surfaces, having raised cutting surfaces or teeth made by indentations of a chisel. Files are of various shapes, sizes, and fineness of cut. Those in common use are either flat or triangular in form. They are said to *taper* when they are thinner toward the point; to be *parallel*, when they are of the same dimension throughout; and *blunt*, when they grade between a taper and a parallel. A *rasp* is a similar instrument, but has coarser teeth and is used on soft materials. The file is one of the most ancient tools and is mentioned as early as 109 B.C. Only high-grade steel is used in manufacturing files.

Filefish (*fil'fish*), a class of small fishes native to the tropical and temperate waters, so named because the stout dorsal spine is armed with two rows of barbs, giving the appearance of a file. Both jaws are furnished with teeth, each having eight teeth in a row, and the body is covered with hard rhomboidal scales. The *barnacle eater*, a species of filefish, occurs in the Atlantic off New England and Newfoundland. It attains a length of 18 in., has a tawny color, and is frequently seen in aquariums. A species native to the Mediterranean is about 2 ft. long. The filefish is allied to the trigger fishes.

Filibusters (*fil'i-büs-tērz*), a name applied originally to the pirates of the West Indies in the 17th century. The word is of Spanish origin, in

which language it designates a fast-sailing vessel or flyboat. It came to be the name of the adventurers who organized expeditions in the U.S. to gain control of West Indian and Central American regions with the hope of having them annexed to the U.S., and thus to extend the slave territory. Gen. William Walker, who was captured, courtmartialled, and shot Sept. 12, 1860, was the most noted of the filibusters.

The term filibuster also refers to prolonged speeches made by the members of the minority of a legislative body, who seek to delay or defeat the adoption of measures obnoxious to them by raising questions of parliamentary law, making motions to adjourn, or otherwise occupying the floor. Among U.S. Congressmen only Senators can filibuster; there is a limit on debate in the House of Representatives.

Filigree (*fil'i-grê*), the name for ornaments or jewelry made of fine metal threads, usually gold or silver, twisted into a design and fused at the junction of the threads with gold or silver solder. Filigree is a very old form of art, and was practiced by the Egyptians and the Phoenicians. The Greeks were the most skillful of the ancient practitioners of filigree work, however, although the Etruscans also produced many fine examples. In medieval times the technique was used not only for jewelry but for religious objects such as crucifixes, and there survive many exquisite examples, some of them heavily jeweled. During the 10th and 11th centuries the Irish are said to have brought the art to the highest perfection it ever reached. In modern times, work in filigree is done chiefly in India, Turkey, and the countries on the northern shore of the Mediterranean.

Fillmore (*fil'môr*), MILLARD, 13th President of the U.S., born in Locke, N.Y., Jan. 7, 1800; died in Buffalo, March 8, 1874. He came of New England stock, although he was born in New York's Cayuga County. He earned his way to the bar by teaching a country school. He was twice married; to Abigail Powers, in 1826, and, after her death in 1853, to Mrs. Caroline C. McIntosh in 1858.

Fillmore won the attention of Thurlow Weed (*q.v.*), and followed that astute party leader from the Anti-Masonic movement to the Whigs. Fillmore moved to Buffalo, practiced law and politics and served in Congress, 1833-35, and again from 1837-43. A follower of Henry Clay (*q.v.*), although opposed to the U.S. Bank, Fillmore owed his place as Vice-President on the 1848 ticket to the desire to placate the Clay faction angered by the nomination of Zachary Taylor (*q.v.*).

As President of the Senate, Fillmore kept order during the bitter debates of 1849-50, and urged compromise for the Union's sake when he suc-

FILTER

ceeded Taylor (1850). After signing the bills compromising the Clay program, Fillmore enforced the unpopular Fugitive Slave law. Matthew Perry's expedition to Japan fell in his term of office. In 1856 Fillmore accepted the Presidential nomination of the anti-foreign American (Know-Nothing) Party to stress the perils of sectionalism, but lost against Franklin Pierce. Fillmore opposed Lincoln's conduct of the Civil War, supported George B. McClellan (*q.v.*) in 1864, and died during the depression of 1873, forgotten as a national figure. Colorless in speech and writing, Fillmore's most striking act was to refuse a D.C.L. from Oxford on the ground that he had not deserved the honor by either literary or scientific attainment.

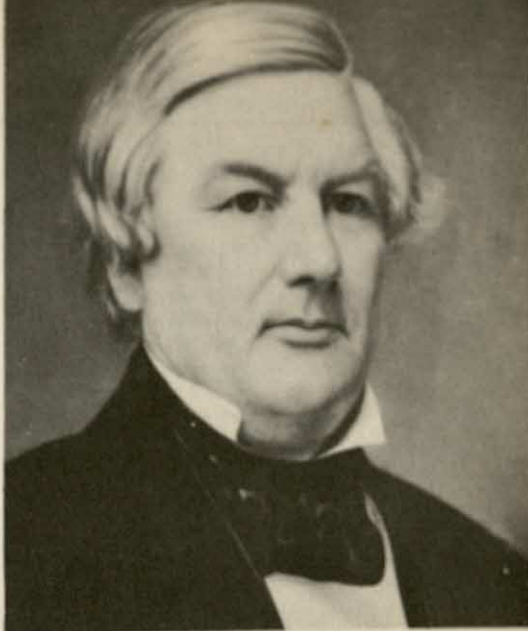
Filter (*fil'tēr*), a porous article, matted fiber, paper, cloth, charcoal, sand, etc., whose interstices are too small to admit the passage of solid matter suspended in fluids. Air and gases may be filtered or purified by being passed through matted fibers, by various web scrubbing processes, and in difficult cases, by electrical precipitation of the foreign particles.

Filter, in photography, a lens which admits selected color rays or components of light.

Filtration (*fil-trā'shūn*), the process of separating solid particles from liquids by means of a porous material through which the liquid passes, but which retains the solid particles. The ordinary method is to pass the liquid by gravity through a filter. However, filtration may be accomplished by use of the centrifuge; by forcing the liquid through a filter with vacuum suction; or by forcing the liquid through the filter with air pressure. Filtering materials contain pores and are selected according to the size of the solid particles to be removed. For example, large quantities of water may be passed through sand or gravel which acts as a filter; while a disk of nitrocellulose with perforations as small as 0.03-3 microns is used in filtering certain bacteria. Materials used as filters include asbestos and glass wool; porous clay; paper; perforated platinum, glass or porcelain; nitrocellulose; diatomaceous earth; bone or animal charcoal; canvas, etc. A liquid which has passed through a filter is called a filtrate.

In physics, filtering or filtration of light consists in passing light through a colored glass or semi-transparent substance which absorbs the rays of a specific wave length.

Finch (*finch*), the popular name of various small birds, many of them having fine plumage and a beautiful song. They are usually called *hard-billed* songbirds to distinguish them from the warblers or *soft-billed* songsters. Not less than 550 species have been described, of which 135 are found in Canada and the U.S. Various species of the finches inhabit nearly all parts of the



Courtesy N. Y. Historical Society

MILLARD FILLMORE

globe, except Australia, but they are most abundant in the Northern Hemisphere. They are variously known as bullfinch, chaffinch, hawfinch, and pinefinch. These birds may be distinguished by their strongly formed bill, suitable for crushing seed, on which they feed.

Finck (*finē*), HENRY THEOPHILUS, music critic, born in Bethel, Mo., Sept. 22, 1854; died Oct. 1, 1926. He removed to Portland, Ore., at an early age, where he attended school and studied music. Later he studied at Harvard and abroad. In 1881 he became musical editor of the *New York Evening Post*. In musical theory he supported Wagner, of whose compositions he was the leading advocate in the U.S. Among his published works are: "Wagner and His Music," "Chopin, and Other Musical Essays," "Pictorial Wagner," and "Songs and Song Writers."

Fin-de-Siècle (*fān-dē-syā'kl'*), French, meaning end of the (19th) century. It has become an internationally used term signifying an approach toward human values characterized by cynicism and oversophistication. It is expressed most clearly in the writings of French poets and novelists of the last decade of the 19th century and had a notable influence on English writers, as Ernest Dowson, Arthur Symonds, and Oscar Wilde.

Findlay (*find'lā*), county seat of Hancock County, Ohio, on the Blanchard River, about 42 m. s. of Toledo. It is on the Big Four, the New York Central, the Nickel Plate, the Baltimore & Ohio, and other railroads. It was incorporated in 1837. Population, 1900, 17,613; in 1940, 20,228.

Fine Arts (*fīn ārtz*). See *Art*; *Music*; etc.

Fingal's Cave (*fīng'gālz kāv*), a celebrated natural cavern on the island of Staffa, off the

western shore of Scotland. The basaltic columns consist of immense dikes with diversified though symmetrical forms, and are joined to the rocks with much beauty. At the entrance it is 42 ft. wide and at the end 22 ft. It is 227 ft. long. The height of the arched roof is 65 ft. The cave can be entered by small boats, since the low-water mark in the cave is about 20 ft. This cavern presents one of the most picturesque of the many nonvolcanic igneous eruptions found in the earth's crust.

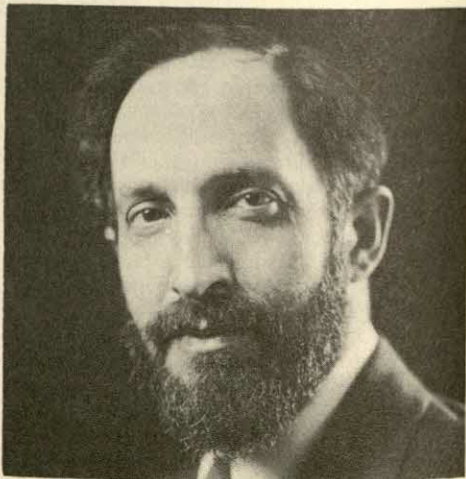
Fingerprinting (*fīŋ'gēr prīnt'ing*), the means of identifying persons by impressions taken of the ridge formations on the inside of their fingers. To obtain such prints, the fingers and/or thumbs are pressed upon a surface covered with black ink, after which they are photographed and compared with impressions left on glass, paper, or other surfaces by the person to be identified. It is a singular fact that the lines and whorls of the fingers and thumbs differ with each individual and that age does not materially change the surfaces, hence this means of identification is dependable.

It was not until the 19th century that fingerprinting was used by governments for criminal identification. The filing of fingerprints so that specific identifications can be made as quickly as possible at first presented a difficult problem. Sir E.R. Henry instituted a simple, workable system for the English government in 1901; today most English-speaking countries have based their filing systems on Henry's original plan. The most scientific method of identification at present, fingerprinting has been universally adopted. In the U.S. there is a single national system, the *Identification Division* of the Federal Bureau of Investigation (*q.v.*). This agency not only keeps on file criminal fingerprints but also maintains a separate file for non-criminal persons, such as war plant workers, civilian defense volunteer workers, aliens, etc. Using a modified Henry filing system, the FBI fingerprint experts can identify a set of prints within a few minutes; it is estimated that the FBI identifies within 36 hours over 20,000 fingerprints received in the daily course of business.

Fink (*fīngk*), MIKE, Western hero, who has come to be known in American legend as the last of the famed Mississippi boatmen, born in 1770. At 17 he enlisted in the corps of Indian scouts where he acquired a great reputation for boldness and cunning and for being the best shot in Pittsburgh. Later he joined the boatmen of the Mississippi and Ohio and soon distinguished himself as the "king of the keelboatmen." He was a champion marksman and fighter, but his exploits often took the form of sadistic pranks, such as shooting off an Indian's scalp lock (a most sacred possession, since the Indians believed they could not enter the eternal hunting grounds with-

out it). After the steamboat came into general use, Fink joined various trapping and trading expeditions. His death was reported in a dozen different places, and the time has never been ascertained. It is believed that he was killed during a drunken brawl while in the service of a trapping company in Montana.

Finkelstein (*fīng'kel-stīn*), LOUIS, professor of theology, born Cincinnati, O., June 14, 1895. He obtained his Ph.D. at Columbia Univ. (1918), studied at the Jewish Theological Sem. in New York City, and became a member of that faculty in 1920. He received the Abraham Berliant Award for research in Jewish history (1921), and in 1923 was awarded the Hattarat Horash award—the highest honor given by the seminary for rabbinical ordination. Acknowledged as one of the greatest Jewish scholars, he later gave up his rabbinical post to devote full time to teaching at the Jewish Theological Sem., where he became Solomon Schechter professor of theology. He was elected president of the Rabbinical Assembly of America (1928-30), served as a member of the executive committee of the United Synagogues of America (1932-39), and in 1940 was a delegate to the Synagogue Council of America. He is author of "Jewish Self-Government in the Middle Ages" (1922), "The Pharisees—the Theologi-



LOUIS FINKELSTEIN

cal Background of Their Faith" (1938), "Beliefs and Practices of Judaism" (1941), and "Pre-Maccabean Documents in the Passover Haggadah" (1943).

Finland (*fīn'land*), in Finnish: *SUOMI* (*suo'-mi*), an independent country in the northwestern part of Europe, with an area of 130,210 sq. m. (including the Porkkala district, 115 sq. m., leased to Russia). Finland is bounded on the n. by Norway, e. by the U.S.S.R., s. by the Gulf of Fin-

land, and w. by Sweden and the Gulf of Bothnia. The region includes many lakes and marshes, the largest of the lakes being Kallavesi, Inari, Tornio, Oulu, Saimaa, and Päijänne. Many of these lakes are connected by canals of considerable commercial value. The railroads, with a total of about 3,100 m., are under government control and connect all the important centers. The rivers are unimportant, and there are no great mountain elevations. Vast forests of conifers and birches cover about two-thirds of the land surface. Finland has no coal, but instead large deposits of peat. Granite, copper, and some nickel and iron ore are the chief minerals. Among the chief agricultural products are oats, rye, wheat, and barley. The climate is affected by the adjacent water surface, rendering it suitable for the production of pears, apples, and small fruits, but the larger species thrive only in the southern portions. Many of the lakes and streams abound with salmon, trout, perch, pike, and other food fish. All the domestic animals common to Europe are reared with profit, especially cattle, horses, sheep, and swine.

COMMERCE. The principal exports are timber, prefabricated houses, plywood, pulp, and paper; in normal times, also butter, eggs, and bacon. Coal, iron, machinery, raw cotton, and foodstuffs are imported. The largest share of trade was, before World War II, with Great Britain, Germany, and the U.S. Following the war, the annual shipment of ca. \$35,000,000 (gold parity) of war reparations goods to the Soviet Union was an important part of Finland's commercial activity. In 1948 her imports consisted of \$488,000,000 and exports of \$415,000,000.

INHABITANTS. The people consist mostly of Finns, whose language, Finnish, is spoken by about nine-tenths of the population, Swedish being spoken by the remaining one-tenth. Lutheranism, the established religion, is the faith of practically the entire population; only 160,000 belong to other churches. Helsinki is the capital and chief city. Other cities include Turku and Tampere. Population, 1947 (est.), 4,100,000.

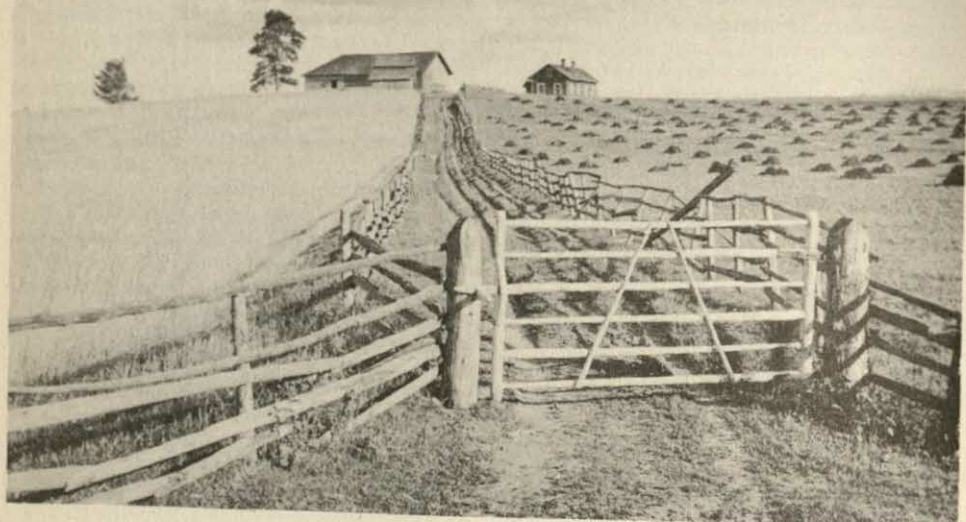
LANGUAGE. The Finns are related to the Magyars of Hungary, and differ in language and habits from the Russians and Swedes. The language belongs to the Fenno-Ugrian group, which is also spoken by the people of Hungary, the Baltic provinces, eastern Carrelia, and parts of northern Russia. Their literature is valuable especially on account of the richness and beauty of its poetry, and the language has a wealth of vowels and diphthongs and is uncommonly flexible. Finnish and Swedish are both official languages; Finnish, being that of the majority, has nevertheless superseded Swedish, especially in public life.

GOVERNMENT. The executive authority is vested

in the president, who is assisted by a responsible cabinet. The present constitution went into force in 1919, under which the legislative function is exercised by a diet of 200 members, who are elected by universal suffrage without distinction of sex. The state of education, like that of the Scandinavian countries, is on a high plane. Nearly the entire population is able to read and write—the result of compulsory attendance laws and a free primary school system for both sexes. Helsinki is the seat of literary life and impulse. Finland has three universities and seven colleges of university standard, the largest being the state university at Helsinki, which has an annual attendance of about 8,000 students.

FINANCE. The Bank of Finland is the state bank, under the guarantee of the House of Representatives. The unit of currency is the mark (Finnish, *markka*) which consists of 100 penni. Finland was on the gold standard from 1925 until 1931. The rate of exchange is 231 *markkaa* to the dollar since devaluation in 1949. See also *Coins*.

HISTORY. The Finns had independent chiefs up to the 12th century and were a warlike people. They were conquered by the Swedes about 1150 and their conversion to Christianity followed soon after. Peter the Great of Russia secured a portion of their territory by treaty in 1721, and Russia conquered the remainder from the Swedes in 1809, after which time it belonged to that country as an autonomous grand-duchy directly under the crown until 1917. In 1903, the privilege of autonomy was removed, but it was restored in 1905, at the time of the general strike in Russia. At the same time woman suffrage was established. In 1917, Finland declared its independence from Russia. Her sovereignty internationally recognized soon after World War I, Finland set out on a policy of democratic constructiveness. During World War II, Russia requested a readjustment of Soviet-Finnish relations, asking for certain port privileges, the cession and/or exchange of areas considered vital to Russia's defense. Negotiations broke down and Russia declared war on Finland in November 1939. After three months Finland sued for peace, ceding 16,173 sq. m. (comprising the Karelian Isthmus, Viipuri, some islands in the Finnish Gulf, and the western half of the Rybach Peninsula) to Russia. This lost territory was reoccupied in 1941 when Finland joined Germany in the attack on Russia. Great Britain declared war on Finland, Dec. 7, 1941, while U.S.-Finnish relations took a turn for the worse when Finland did not avail herself of the existing opportunities of making peace with Russia, America's ally in the war. With Russian forces marching westward to victory over the Germans, the Finns sued for peace, and an armistice was signed on Sept. 19, 1944, reinstating the land cessions of the Moscow peace



RURAL FINLAND

Courtesy Ewing Galloway, N. Y.

treaty of 1940 and providing for: reparations (\$300,000,000 payable in six years) to be made to Russia, Finnish assistance in the ousting of Germans from Finland, lease of the Porkkala territory near the capital for 50 years, etc. The present aim of Finnish policy is to achieve "good neighbor" relations with the Soviet Union, at the same time resuming the friendly relations with the U.S. which prevailed through the years between the two world wars (e.g., Finland paid its loan obligations throughout the years of depression).

A peace treaty embodying most of the 1944 armistice terms was signed at Paris in February 1947.

Finland, GULF OF, an extensive arm of the Baltic Sea, extending to the east between Finland on the north and Russia on the south. The width is from 10 to 75 m. and the length is 250 m. It receives the outflow from Lakes Ladoga and Onega. Within the gulf are numerous islands, sandbanks, and shoals. The shores are rocky and precipitous and the waters only slightly salty. Viborg, Reval, and Helsingfors are large and safe harbors.

Finley (*fin'lē*), JOHN HUSTON, educator and editor, born at Grand Rapids, Ill., in 1863; died in 1940. A graduate of Knox Coll. and Johns Hopkins Univ., he was successively president of Knox Coll. (1892-99), professor of politics at Princeton Univ. (1900-03), president of the Coll. of the City of New York (1903-13), and New York state commissioner of education (1913-21). He

edited *Harper's Weekly* (1899), *McClure's Magazine* (1899-1900), and was associated with the *New York Times* (1921-37), as associate editor, and as editor-in-chief in 1938. He served on several international committees during and after World War I. His books include: "A Pilgrim in Palestine" (1918) and "The Debt Eternal" (1923).

Finney (*fin'ni*), CHARLES GRANDISON, clergyman, born in Warren, Conn., Aug. 29, 1792; died in Oberlin, O., Aug. 16, 1875. Licensed to preach in 1824, he soon entered upon evangelistic work and attained marked success in Troy, Utica, Boston, Philadelphia, and New York. In 1835 he became professor of theology at Oberlin Coll. and was its president from 1851-66. Later he labored in Europe as a revivalist for three years. Among his publications are: "Sermons on Important Subjects," "Lectures on Revivals of Religion," "Sermons on Gospel Themes," and "Lectures to Professing Christians."

Fins (*finz*), the organs of fish which serve to propel, balance, or steer them in the water. They usually consist of rays of bones covered with an elastic membrane. The *pectoral* or breast fins, a short distance behind the gills, are modifications of the anterior limbs in other vertebrate animals, and the *anal* fins, near the anus, correspond to the hind limbs. The *dorsal* or back fins are from one to four in number, depending upon the species, and the *ventral* or belly fin usually is a modification of the skin. The tail is known as the *caudal* fin. Fins are usually divided into *paired*

and unpaired, the former including the pectoral and sometimes the anal and the dorsal. The term *fin* is often applied to the paddles of a whale, but never to the hind feet of seals or the webbed feet of birds. See also color plates, *Marine and Fresh Water Fish I and II*, Volume V; *Ocean Life Among the Coral Reefs of the Tropical Pacific I, II, and III*, and *Tropical Aquarium Fish*, Volume VIII.

Finsen (*fīn'sēn*), NIELS RYBERG, scientist, born in Denmark in 1861; died in 1904. He was graduated from the Univ. of Copenhagen in 1890, and founded a successful medical practice in that city. His success in treating diseases by the use of light rays, especially tuberculosis of the skin, caused the Danish government to aid him in founding near Copenhagen the Finsen Medical Light Inst. His experiments did much to extend the use of electricity in medicine. He was awarded the Nobel Medical Prize in 1903.

Fiord (*fyōrd*). See *Fjord*.

Fir (*jēr*), a name once used coextensively with the widest sense of the word *pine*, but now restricted by botanists to the one genus *Abies*, which includes the spruce fir, silver fir, Norway spruce, and other species. The trees of this genus belong to the family *Coniferae*. They are distinguished from the pines by the flat, rounded apex of the scales of their cones, and by leaves not in clusters of definite number. Fir trees are found in many parts of Eurasia and America, where they occur in fine forests, and the lumber and other products derived from them are important articles of commerce. From the *Norway spruce* is obtained lamp-black, tar, turpentine, resin, and Burgundy pitch. The bark is used in tanning and for making baskets, the roots yield fibers for cordage, and the wood is employed for fuel, house building, and making masts and spars of ships. In the market the wood of the Norway spruce is known as Christiania deal and Danzig deal. The *white spruce*, or *white fir*, which ranges from Lower California to British Columbia, is one of the finest trees of that region and attains a height of 300 ft. *Hemlock* forms dense forests in the northern part of the U.S. and in Canada, extending as far as Hudson Bay. The bark is valued for tanning, while the wood is used for construction purposes. In the northwestern part of North America is found the *Douglas fir*, which often grows 250 ft. high. Canada balsam is obtained from the *balm of Gilead fir*.

Firdausi (*jēr-dou'sē*), or FIRDUSI, ABDUL KASIM MANSUR, epic poet, born near Tus, Persia, about 940 A.D.; died in 1020. He is sometimes called Thousi from the place of his birth, but from his poems he is called Firdausi, which has reference to both garden and paradise. The Sultan Mahmud invited him to his court at Ghuznee, or Ghazni, where he came in contact with the most distin-

guished scholars and poets of his time. His great work, entitled "Shah Nameh," treats of the history of Persia from remote antiquity until the Mohammedan conquest in 641 A.D. It contains 60,000 verses, and is more than seven times longer than Homer's "Iliad." The "Shah Nameh" is the oldest poetic work of Persian literature, and is regarded by the Orientals as the highest authority for the primitive history of Western Asia. It was adopted by the disciples of Zoroaster, and was translated into a number of European languages. Jacob Joseph von Görres (1776-1848) translated it into German and Jules Mohl made a French translation. An English translation was published in 1831.

Fire (*fīr*), the bright flame produced by ignition or combustion. The use of fire was known to earliest man back to *Eoanthropus*, who lived a million years ago. Fire has been the object of many superstitions and certain peoples have worshiped it fervidly, seemingly associating it with the sun, upon which physical life on earth depends. Aristotle (384-322 B.C.), in formulating a model of the universe, adopted the beliefs of his predecessors and depicted four essential elements: earth and water (the world) and fire and air (the atmosphere). G.E. Stahl (1660-1734) confused the science of chemistry until 1774 by inventing the word "phlogiston" to explain burning. Materials, he asserted, when burned permitted a fluid, phlogiston, to escape, which caused fire, smoke and ashes.

The use of fire was widespread among all primitive peoples of the world, all but one of which could produce it at will by various methods, including the bow and fire-drill and the stick rubbed in a groove. The Andaman Islanders alone did not know how to produce fire except to transfer lighted brands from fires continuously kept burning. Fire produced by the friction of wood-on-wood requires special woods, yet despite the diverse geographical locations and different woods, the right combinations were found. Before 1800, civilized peoples carried a tinder box which contained tinder (combustible material) and flint and steel to start a fire. Fire was not produced by the use of frictional matches until 1805, when a match with a tip of sugar and potassium chlorate was invented. This was followed by the invention (1827) of the lucifer match with its tip of phosphorus, potassium chlorate, saltpeter, and other combustibles, and by the sulphur match which contained added sulphur. Later the safety match was developed, which cannot be ignited by friction except on a special surface. Phosphorus is omitted from the match head, but is mixed with antimony trisulphide and applied to a special striking surface which accompanies the package of matches. The frictional union of the match head with the phosphorus on the



Courtesy American Forest Products Industries,
Wash., D. C.

FIRE FIGHTERS

Preventing forest fires is a year-round endeavor, and new methods are steadily being developed. Men working with fire extinguishers are supplemented by so-called smoke jumpers, or airborne fire fighters, who parachute into inaccessible areas. Radio communication and mechanized equipment are also brought into use. Lookout stations, largely maintained by the Forest Service, are constantly on the watch for incipient forest fires

scratching surface produces the flame. Most cigarette lighters utilize the principle of flint on steel, which ignites vapor from a "lighter fluid," such as benzene. However, one type of cigarette lighter uses a fine screen treated with chloroplatinic acid. The absorptive powers of the platinum are greatly increased by the surface of the wire screen, and the platinum acts as a catalyst to oxidize methyl alcohol vapor, and, when opened, the lighter soon comes to a glow.

Fire is the result of rapid combustion, or the rapid combining of oxygen with gases from the material being burned (oxidized). Materials which burn are always oxidizing slowly in the air, but this process takes a long time and the heat produced is absorbed by the surrounding air. If this slow heat accumulates, spontaneous combustion occurs. Oily rags in enclosed places, where the oil slowly oxidizes and the heat accumulates to the kindling point of the rags, are frequently a cause of spontaneous combustion. Similarly, improperly stored hay may catch fire. Ship fires have been caused by the wrong storage of hemp, coal, etc., in holds. Combustible materials in common use are wood, peat, coal, coke, gasoline, kerosene, fuel oils, water gas, producer gas, natural gas, coal gas, and acetylene.

Fire causes annual losses of about 7,000 human lives and more than \$1,000,000,000 property damage in the U.S.

Fire Alarm (*ä-lärm'*), an apparatus for communicating warning of a fire, either electrical or mechanical. An automatic arrangement is now in use which depends for its action upon the sudden increase in temperature in the vicinity of the fire causing a liquid or a gas to expand to actuate a mechanical alarm. The burning away of con-



Courtesy American Forest Products Industries,
Wash., D. C.

FIRE-GUTTED FOREST

Thousands of fires ravage the forests of the U.S. each year, leaving in their wake destruction such as in the picture above. With the introduction of improved fire-fighting techniques, the average yearly loss has decreased from 30,000,000 acres some 20 years earlier to 4,000,000 acres in recent years

necting cords or the melting of low-melting-point alloys may accomplish that purpose. In large cities fire-alarm boxes are situated at intervals where one may turn in an alarm to the central fire station. The alarm merely indicates the location of the box, it being presupposed that the one turning in the alarm will remain at the box to direct the fire engines to the exact location of the fire.

Firearms (*fīr'ärmz*). See *Cannon; Gun; Machine Gun; Rifle*, etc.

Fireball (*fīr'bal*). See *Meteors*.

Fire Clay (*fīr elā*), a variety of clay found in a stratum below the coal formations and sometimes elsewhere. It is used in the manufacture of brick, tile, gas retorts, and other vessels suitable to withstand high temperatures. The principal constituents of fire clay are silica and alumina, accompanied by small proportions of iron, lime, magnesia, water, and organic matter. Fire clay is found extensively in Canada and the U.S. and occurs in all the continents.

Fire Control (*fīr kōn-trōl'*), in military terminology, the preparation and direction of effective weapon fire on a given target, and the ability to command the laying down of fire upon a target. Apparatus connected with fire control includes range finders, telescopes, directors, radio observation stations, and other instruments used with the guns or weapons employed.

Firecrackers (*fīr'eräe-ērz*). See *Fireworks*.

Fire Damp (*fīr dämp*), or METHANE GAS (CH_4), mixed with air, which frequently occurs in coal mines. Miners call it "fire damp" from its explosive nature and the old word "damp" for gas or vapor. Methane is formed by the decay of vegetable matter in the absence of air, and is also

called "marsh gas." It is the chief constituent of natural illuminating gas. Its occurrence in coal mines is the result of the vegetable matter comprising coal. The safety lamp, invented by Sir Humphry Davy (1778-1829), with its "corpse light" is used to protect miners against possible fire-damp explosion which might be caused by the use of ordinary lamps in mines.

Fire Department (*dê-pärt'ment*), an organization maintained in towns and cities as a means of protection against fires. This department of a municipal government is supported by general taxation and may be either paid or voluntary. A *paid fire department* is one in which the chief and his assistants are employed regularly on a salary, while a *volunteer department* is made up of members who serve only when called by a fire alarm, and they are paid only for the time they actually attend fires. Some cities maintain both classes of organizations, as a means of security during large conflagrations, and the volunteers are paid only for the actual time of service.

Paid fire departments are maintained in practically all towns and cities with populations of more than 5,000, and those in charge as employees of the city give their entire time, both day and night, to the duties incumbent upon them. The smaller cities have a single fire station, while more populous places have a central and several branch stations, where the fire engines, ladders, chemical engines, hose carts, and other apparatus are kept ready for use.

Fire Engine (*ên'jin*), a machine designed for transportation of fire-fighting equipment for the purpose of extinguishing fires and saving of life and property.

The modern fire engine carries a pump for use, when required, to increase water pressure from city mains. It also is used to supply water for fire fighting and fire protection of adjacent buildings from sources other than city mains.

In addition to the pump, the fire engine carries a large hose supply, a water tank as a supply source for most residence fires, ladders, small extinguishers, forcible-entry tools, and life-saving equipment.

History records the use of a mechanical fire pump, hand operated, about 400 B.C. Hand-operated fire pumps were used extensively and with refinements until about 1905. A few are still in active use. To increase the amount of water discharged and to lessen the labor, the first steam fire engine was developed in London, England, in 1829. The first steam fire engine built in the U.S. was produced in New York City in 1840-41. The use of the steam fire engine became quite general and it was manufactured until 1914. The first gasoline-driven fire engines were made in 1910 and this type has superseded the steamer in all active fire service.

The modern fire engine using a gasoline motor for propulsion of the vehicle and as a source of power is in use in virtually all cities, towns, villages and rural communities.

Fire engines are rated according to pump capacity as standardized by ratings established by the National Board of Fire Underwriters. These pumps are capable of pumping water at the rate of 500 to 1,500 gallons per minute at a pressure of 150 pounds per sq. in. Mounted on the fire engine is usually a booster tank containing from 100 to 500 gallons of water for immediate use at a fire while the necessary connections are being made to the main water supply.

Included in the equipment of the modern fire engine are all the tools necessary for the fire fighter, such as boots, rubberized clothing, helmets, suction hose, fire hose, ladders, lighting systems, electric-wire cutters, gas masks, foam generators, fire extinguishers, forcible-entry tools, axes, pike poles, and a variety of nozzles, wrenches, life nets. In fact, the modern fire engine is a portable storehouse containing all of the devices and tools necessary for the modern fireman to protect and preserve life and property.

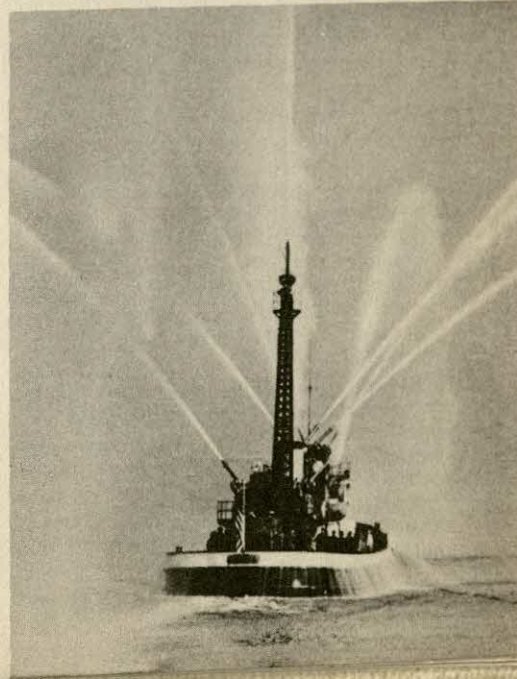
Many seaports have fire engines that are mounted on fire boats.

Fire Extinguishers (*ěks-tîp'gwîsh-ěrz*), (1) portable devices for the extinguishing of fires; (2) chemical agents utilized in extinguishing

FIRE BOAT

The "Fire Fighter" forces out 22,000 gal. of water per minute. A stream of water can be thrown 750 ft.

Courtesy Cleveland Diesel Engine Div., Gen'l. Motors



fires. The most common agent (other than water) used for this purpose is a solution of sodium bicarbonate acted upon by sulphuric acid. The release of carbon dioxide gas resulting from the reaction produces pressure to expel the liquid from the container on to the fire. Used for fire in wood, textiles, rubbish. Another form requires the use of aluminum sulphate solution reacting with a solution of sodium bicarbonate containing a foam-stabilizing ingredient. The reaction produces a stiff foam which, being directed upon a fire in petroleum products, floats upon the surface of the fuel and smothers the fire. A third extinguishing material consists essentially of carbon tetrachloride, usually expelled by manual pumping onto a fire. This is used largely for small electrical hazards and motorcar fires. A fourth type consists of an inert gaseous material under its own pressure, usually carbon dioxide, which, upon being released, forces itself from its container and smothers the fire. It is used principally for large electric generator risks, electric switchboards, and small alcohol, gasoline, and solvent fires, especially when located in a confined space.

Firefly (*fīr'flī*), the name commonly applied to all winged luminous insects. They abound in temperate and tropical latitudes throughout the world, especially in moist woods, or wet and marshy areas. Some have a steady glow, but most species, as they fly, emit their light at regular, controlled intervals. In most of these insects the light organs are located in one or more (normally two or three) segments near the end of the abdomen. The larvae of some of the species of fireflies are also luminous and are called glowworms. The common fireflies or lightning bugs, which are not much over half an inch long, belong to the family *Lampyridae*. Another family, the *Elaterridae*, has some species living in tropical America and the East Indies that emit a brilliant light from two eyelike tubercles on the thorax. This light is so powerful that when several of these beetles are placed in a glass container they make a fair reading lamp. See also *Glowworm*.

Fireproofing (*fīr'prōōf-ing*), a term used to describe the construction of buildings, treatment of portions of buildings, or apparatus by which they become partly or wholly invulnerable to damage by fire. The safeguards adopted early in the history of constructive building consisted of using brick or stone, and later iron, for doors, lintels, and stairways. These and other methods are now in common use, while in large cities every building must be constructed according to certain specified conditions provided by the city authorities. Wood treated with silicate of soda is made largely proof against fire, since the application of strong heat fuses it into a kind of glass that forms a shield of protection. Cloth or wood does not blaze if impregnated with certain saline

substances, such as phosphate of soda or ammonia, borax, alum, and many other chemicals. Cloth may be treated with graphite in a bath and then placed in an electro-metallic bath apparatus by which the cloth is coated with metal. Woolen and ordinary fabrics are rendered flameproof by being treated with borax, alum, or soluble glass.

Papers and valuable documents are preserved in fireproof safes, which are constructed with double walls, the intervening space being filled with a nonconductor of heat. In the tall buildings of cities marked precaution is taken in the construction of all portions exposed to fire, and, as a further safeguard, metal shutters and metal windows with wire-glass panels are used to protect the outside windows against the entrance of fire from a neighboring building while burning. Besides, 4 and 6 in. standpipe fire lines extend from the basement to the upper story, these being connected with pumps below and gravity water supply tanks on the roof, and there are water buckets, hand grenades, and mechanical extinguishers for protection against incipient damage by fire. Many structures provide stairways and openings for the passage of firemen.

Firestone (*fīr'stōn*), HARVEY SAMUEL, manufacturer, born in Columbiana County, Ohio, Dec. 20, 1868; died in 1938. He removed to Chicago and established a large business in the manufacture of automobile tires and other rubber articles. To obtain rubber at reasonable prices, he developed rubber-growing plantations in Liberia and the Philippines.

Fireworks (*fīr'wɔrkz*), the common name of preparations containing combustibles and explosives, such as charcoal, niter, and sulphur, with chemicals producing colored lights or scintillations in burning, and used to make displays at festivals, expositions, or at times of public rejoicing. Many forms are made, according to the effects desired, such as crackers, rockets, squibs, Roman candles, torpedoes, balloons, wheels, and other arranged pieces. Some are contrived with ingenuity and skill, and, when ignited, represent various pictures and devices. The powder utilized in fireworks is made according to the same principle as gunpowder, but with it are used charcoal, niter, sulphur, and other substances to influence the explosive properties and give tint or coloring. Filings of zinc impart a bluish color, iron or steel filings increase brightness, and a greenish tint is secured by copper filings.

The Chinese and Hindus manufactured fireworks many centuries before they became known to the Europeans, largely because they knew of gunpowder much earlier than western people. They utilized them at festivals and celebrations. Many of the different devices employed in producing noise and illuminations at night are of Chinese manufacture, though within recent years

large establishments have been built in Europe and America at which all classes of fireworks are manufactured. The largest establishment of this character is located in New Jersey. Firecrackers are among the most popular devices used for celebrations. They consist of a tube made of strawboard, are from 2 to 15 in. long, and have a diameter equal to about one-tenth of the length. The newer process of manufacture has made it possible for one person to make about 2,500 tubes per day. These tubes are plugged with pasteboard wad, cord, or pith at one end and at the other with clay or wood pulp, and in the latter a fuse is placed. The explosive is on the interior and with it the fuse articulates. When finished, the firecrackers are covered with an artistic red paper, dried, and packed ready for the market.

Fire Worship (*fir wop'ship*). See *Parsees*.

First Aid (*furst ad*) is the immediate, temporary treatment given in case of accident or sudden illness before the services of a physician can be secured (American Red Cross First Aid Textbook). Anyone practicing first aid should keep this definition in mind. The object of first aid is to minimize the secondary dangers and complications relative to minor injuries, to prevent further damage or death in cases of serious injury or illness, and to maintain the patient in as good condition as possible until a physician can institute proper definitive and curative treatment.

ACCIDENTS. All kinds of injuries, and, too often, death, are incurred every day on our crowded roads due to defective vehicles, poor enforcement of traffic regulations, and, worst of all, defective drivers. Often as not, the careless pedestrian, cyclist, horseman, etc., is as much at fault as the automobile or truck driver. The first aid to be described in this section applies equally as well to similar injuries incurred in other situations. Since broken bones are the most common serious injuries, let us begin with fractures.

BONE FRACTURES. A fracture is a broken bone. There are several types of fractures, but they are generally classed as simple or compound. A simple fracture is a clean break in the bone without the ends puncturing through the skin. A compound fracture is one in which the broken end(s) protrude through the skin. A comminuted fracture is one in which the broken ends of bone are fragmented—this may be simple or compound. A greenstick fracture is incomplete—the break is in one side of the bone only. This type occurs mostly in young people. In impacted fractures the fragments are jammed into each other. In another type the break extends into a joint, such as the knee or elbow. Remember that one or all types of fractures in various combinations may occur in the same patient.

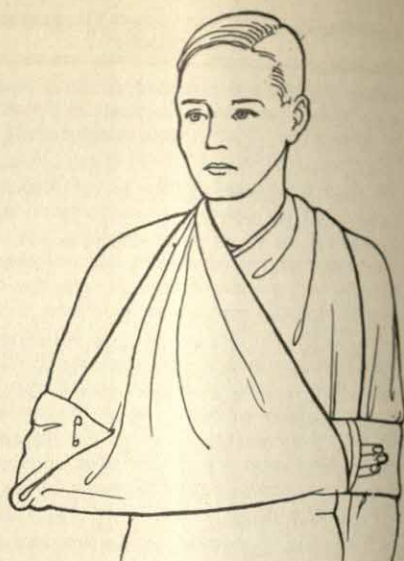
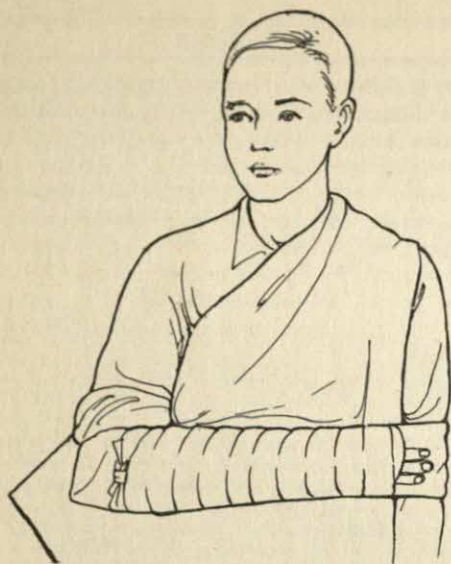
The essential first-aid treatment of fractures is

the application of some sort of splint or dressing which will immobilize the broken bones and adjacent areas in order to prevent further injury while transporting the patient to a physician or hospital. Certain types of fractures are especially dangerous, and these will be emphasized in the descriptions of fractures of the various bones individually. The efficient first aider should know the general structure and function of the bones of the body (see *Anatomy—skeleton*, illustrations).

How to recognize fractures. If the injured person is conscious, he can tell you where he is injured. If he is unconscious, or uncertain, the location of possible fracture is more difficult, and the following tests are usually employed: *False point of motion* (false joint). This is any motion above, below, or between normal joints or articulations. *Crepitus*. A peculiar grating sound or sensation heard or felt at the point of fracture, caused by the broken bone ends rubbing against each other. *Pain over the site of fracture*. This is not definite proof of fracture, but when fracture has occurred, even slight pressure over the area will cause severe pain or tenderness.

Splints. The application of a suitable splint is the first step in first aid for a broken bone except in cases of accompanying severe bleeding or open wound which must be attended first (see later). Remember that it is important not only to immobilize the fracture, but also the points above and below the fractured area, in order to move the injured person with complete safety. Thus if the lower leg is broken, the area from above the knee to the foot should be included in the splint. If the thigh bone is broken, the splint should extend from the waist to below the knee. If only one of two bones in an area, such as the tibia and fibula in the lower leg, or the radius and ulna in the forearm, is broken, the unbroken bone may act as a splint; but do not rely on this—apply a suitable splint anyhow. While moving a limb and applying splints, *always maintain firm traction* in the long axis of the part, and *fix* this traction by the splint. Temporary splints can be made from almost any object at hand, such as boards, fence rails, rods, crutches, canes, tree branches, bedslats, broomsticks, pillows, folded newspapers or magazines, etc., and they may be padded with clothing, grass, hats, etc. The splints may be held in place by bandages and adhesive tape, but in an emergency belts, straps, ropes, or strips of clothing may be used. It is always best, however, not to move a person with a fracture at all, and a splint should be applied by the amateur only when it is absolutely necessary to move the patient before the arrival of the doctor. A good rule is, "Splint him where he lies."

SPECIFIC INSTRUCTIONS FOR PARTICULAR FRACTURES.
Fractures of the Spine. Fractures of the spinal column are always extremely dangerous. Here the treatment at the site of the accident, especially the care in handling and moving the victim, determines the amount and permanency of the paralysis that may result. If the spinal fracture is high, in the region of the cervical (neck) vertebrae, improper handling while moving the victim may result in death by compression injury to the spinal cord. All unconscious accident victims should be treated as if suffering from a severe spinal injury. *Do not move the victim* (before a doctor or well-trained person ar-



TRIANGULAR BANDAGE AS ARM SLING

lives) unless it is necessary to remove him from wreckage or from further injury such as burning or crushing. If he must be moved, make certain not to bend the spine in any direction. Enlist the aid of several persons and roll (do not lift) the victim onto a stretcher or wide plank and move him only far enough to get him out of danger.

Fracture of the ankle. The splint should be box-like, supporting the sides as well as the back of the leg and foot. A pillow or folded blanket may be tied about the foot and ankle to insure immobilization.

Fracture of the humerus (upper arm). Attain fixation by placing a flat wedge of some material in the armpit and binding the arm against the side of the chest with the forearm against the lower chest—or, better, use a Thomas-type short ring traction splint.

Fractures about the elbow. Bend the forearm upward until the hand touches the Adam's apple and maintain in position against the chest with bandages or tape.

Fracture of the forearm. Apply splints to both front and back of the arm and hold in position at right angles to the upper arm and suspend in a sling from the neck.

Fracture of wrist or hand. The splint must extend beyond the fingers. Suspend in a sling as above.

Fracture of the nose. The important first-aid problem is control of hemorrhage if severe. Do not manipulate the nose. Control bleeding by tipping the head back and inserting pledgets of cotton in the nostrils. Gentle pressure may be applied at the sides of the nose. The application of cold compresses gently over the bridge of the nose is soothing.

Fractures of the skull are divided into two groups—fractures of the vault, or top of the skull, and fractures at the base. Bleeding from the nose, ears, or mouth, without apparent injury to these features, indicates fractures of the base. Fractures of the top, except in extreme cases where there is a recognizable depression, can be diagnosed definitely only by x-ray. Shock and/or concussion (see later) are the prime considerations here. After treating for these, remove the patient to a hospital as quickly as possible.

Fractures of the ribs are recognized by sharp pain along the affected ribs on deep breathing. Place a tight smooth binder around the chest to limit rib movements during breathing for relief until the physician arrives. Such fractures are serious because a broken rib may pierce a lung.

HEMORRHAGE. Control of severe bleeding (hemorrhage) is often the life-saving first step in first aid. One should understand the fundamentals of the blood and circulation (see *Blood, Circulation, Heart (Anatomy)*), and *Blood Pressure*) in order to give efficient first aid.

Control of hemorrhage. *Concealed hemorrhage or internal hemorrhage* occurs inside the body cavities such as the abdomen, lungs, intestines, and also inside soft tissues. This occurs with internal injuries and much blood may be lost from the circulation in a short time. If such bleeding is severe, unconsciousness and the state of shock develops. (See later.) *Visible hemorrhage* is bleeding from an external wound which can be seen. Further classification into venous and arterial bleeding must be considered. *Venous* blood is bluish or dark and escapes in a steady ooze or stream. Venous bleeding is easily controlled by slight pressure at the wound edges, or by pressure applied just below the wound at the side away from the heart, since we know its flow is toward the heart. Pressure may be applied with a piece of sterile gauze, a clean handkerchief, or even the fingers if no sterile material is at hand. *Arterial* blood is bright red and flows in rhythmic spurts. When both arterial and venous bleeding occur at the same time, the arterial bleeding must be controlled first. In order to control arterial bleeding deep pressure must often be maintained over one of the main arteries supplying the injured area. Since we know that the direction of arterial flow is away from the heart, this pressure must be applied between the heart and the site of the injury. One often uses a tourniquet for this.

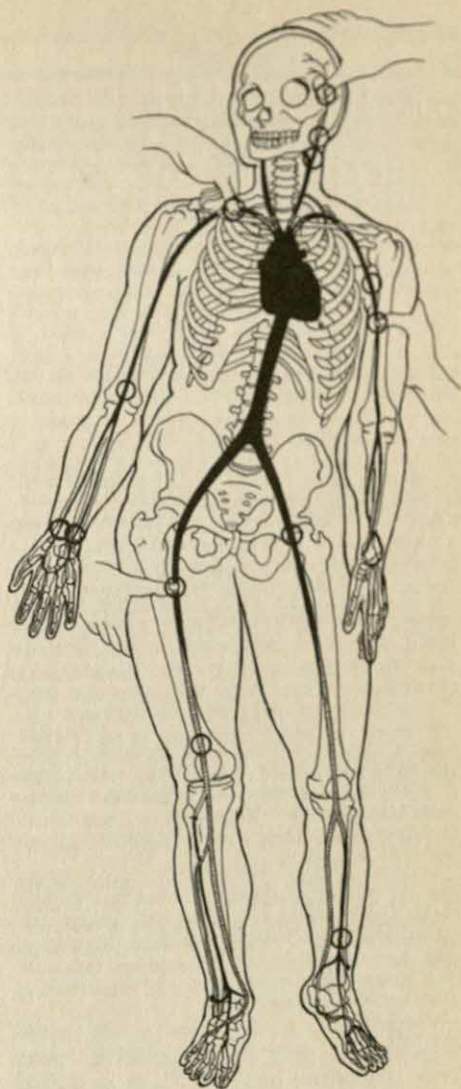
The **tourniquet** is a device to compress a blood vessel in order to control circulation and prevent access of blood to a bleeding part. The tourniquet is

FIRST AID

necessary not only because the large arteries lie deep in the tissues, but also because the firm, elastic walls of the arteries are not easily compressed for any time by the fingers. Tourniquets are best made from tapelike material at least an inch wide. Handkerchiefs, belts, strips of cloth or tire inner tube can be improvised when necessary.

The *tourniquet* is applied by first placing it loosely around the leg or arm over the artery between the site of bleeding and the heart. Several folds of bandage or other soft material are placed under the tourniquet over the vessel to be compressed, and then pressure is applied by twisting the tourniquet with a stick or pencil. Some extremely important rules for use of the tourniquet are: (1) Do not apply a tourniquet unless bleeding cannot be controlled by other means. Do not use narrow tape, twine, or cord. (2) Do not apply more pressure than is required to stop bleeding. (3) Do not apply constant pressure for more than 20 to 30 minutes at a time. (4) Do not forget the tourniquet. Loosen it occasionally to see if bleeding has been controlled. Clot formation in the wound may obviate the tourniquet. Pressure maintained longer than necessary may result in permanent damage to tissues supplied by the compressed vessel.

Where to apply pressure by hand or by tourniquet. *Pressure points.*—*Bleeding from the hand and fingers.* Simply apply and maintain pressure on the flat surface of the wrist on either side just above the palm. The radial artery is thus controlled above the base of the thumb, and likewise the ulnar artery in line with the little finger. *Bleeding from the forearm.* Here the compression point is also on the anterior (front) surface of the arm, exactly in the center just above the bend of the elbow. *Bleeding from lower half of upper arm.* With the arm held straight forward, palm up, the compression point is just below the biceps muscle on the inside, $\frac{2}{3}$ the distance from elbow to armpit. *Bleeding from upper half of upper arm.* Same as just above, but place pressure higher, nearer the armpit. Another simple method is to place a roll of cloth or other soft material in the armpit and hold the arm closely against the side of the chest. *Bleeding from neck and face.* *Three compression points.* Note that each controls bleeding above the point. (1) The side of the neck about $1\frac{1}{2}$ in. below the angle of the jaw. (2) Under and inside the jawbone about an inch in front of the angle of the jaw. Press upward here. (3) About $\frac{1}{2}$ in. in front of the ear at the upper level of its attachment. Note that pressure at these points can be maintained only by hand or skillful bandaging (not by tourniquet). *Bleeding from the scalp* is best controlled by a snug band or bandage completely around the head exerting pressure below the bleeding point. *Bleeding from the leg below the knee.* The pressure point is on the back surface of the leg in the midline just above the bend of the knee. See illustration (1). *Bleeding from the thigh.* The pressure point is high on the inside of the leg in the middle of the groin. Another good point for hand pressure is over the lower edge of the pelvic bone on the bleeding side near the genitals. *Bleeding from wounds of the chest, abdomen, or back* is best controlled by application of a clean bandage and direct pressure over the wound. *Elevation of a wounded extremity*, whenever possible, will help to control bleeding.



IMPORTANT PRESSURE POINTS FOR CONTROL OF SEVERE BLEEDING

WOUNDS. A wound is a break in the continuity of the skin and underlying tissues caused by external violence and associated with more or less bleeding. Wounds are classified as: incised, punctured, lacerated or contused, and gunshot wounds.

Incised wounds are caused by sharp-edged instruments, and there is usually considerable bleeding. They are usually not too dangerous—the free bleeding acts to cleanse the wound. *Treatment:* (1) Control bleeding. Pressure at the edges is usually sufficient unless a large artery is severed, in which case a tourniquet may be necessary. (2) Cleanse or, if possible, sterilize the wound. This is done *chemically* by application of an antiseptic—such as the commercially prepared mercurochrome, metaphen, tincture of iodine, etc.—which kills or retards the growth of infection-causing organisms. Apply directly to the wound area with a piece of sterile gauze or cotton,

or a clean cloth or handkerchief. If no clean material is available, pour the antiseptic directly into the wound, but this is to be avoided if at all possible. *Note:* Be careful with tincture of iodine—be sure to use only the weak ($3\frac{1}{2}\%$) solution, and remove any excess with an alcohol-soaked cloth sponge in order to avoid skin burns and tissue damage. *Mechanical* cleansing is done by washing the surrounding areas and then the wound itself with large amounts of clean water and soap, using sterile cotton or a clean cloth. The wound is then sponged dry and the chemical antiseptic applied as above, if available. If grease or tar are found in the wound, they are best removed by ether or a similar solvent, preferably by a physician. (3) Apply sterile dressings. A *dressing* is simply a covering of gauze or other cloth or absorbent cotton held in place by a bandage or adhesive tape. *Sterile* means completely free from germs or bacteria. If sterile material is not available, use the cleanest possible. (4) Keep the injured part at rest, avoiding unnecessary movement. A splint, sling, or bandage is often helpful.

Punctured wounds are made by pointed instruments, and there is usually but little bleeding. They are often complicated by infection because of poor drainage from the deep portions. Running a nail into the hand or foot is a common example. *Treatment:* Apply antiseptic solution and sterile dressing, and place part at rest. Take the patient to a physician, as these wounds always require expert care.

Contused or lacerated wounds are caused by crushing or tearing force. A contusion is a bruise. A laceration is a ragged tear. Bleeding from such wounds is slight, but there is usually considerable swelling and tissue destruction. *Treatment:* In general as for incised wounds; often ground-in gravel and dirt must be removed.

Tetanus antitoxin. The first-aidler should remember that an immunizing dose of tetanus (lockjaw) antitoxin *must* be given in every case of wound by an unclean object or where dirt or grime has gotten into the wound, especially from streets, farms, etc. The patient should be taken to the doctor immediately for this treatment.

DISLOCATIONS. A dislocation is the forceful separation of a bone from its socket in a joint. Some dislocations are habitual, as in athletes. Most, however, are caused by violence, and are usually serious, the most dangerous being that of the neck or upper spine. Death can occur here by compression or severance of the spinal cord. A dislocation is recognized by abnormal shape and fixation at an articulation or joint, accompanied by pain. First aid in these cases consists only of making the patient comfortable as possible by rest, support, and application of cold compresses. Anything further is too difficult or dangerous for the layman.

SPRAINS AND STRAINS. A *sprain* is the wrenching of a joint with partial rupture or other injury of its ligaments and attachments, without dislocation. A *strain* is the overstretching of a muscle or its tendon until it is injured. Both are accompanied by variable pain, tenderness, and swelling according to the extent of injury.

Treatment of strains and sprains. (1) Apply cold

wet dressings or packs, intermittently, for about an hour at a time. Keep dressings cold by applications of ice bags or by pouring on small amounts of cold water. Wet towels work well here. (2) Apply a cloth or elastic bandage to maintain moderate pressure and support about the injured area. This helps to rest the part and avoid excessive swelling. (3) Keep the part at rest. Keep an injured wrist in a sling. Stay off an injured ankle and elevate the feet. (4) See a physician. Fractures in joint areas should be ruled out by x-ray pictures. Also remember that torn ligaments (sprains) heal slowly and require treatment similar to that for fracture.

ABRASIONS AND CONTUSIONS. An *abrasion* is a superficial wound of the skin caused by friction or scraping. Serum, which may be blood-tinged, oozes out, dries, and forms a hard covering or scab. *Treatment:* Remove foreign matter, if present, with soap and water, apply antiseptic, and cover with sterile dressing. A *contusion* or bruise is injury to the flesh by a blow or a fall without breaking of the skin. The typical ecchymosis (black-and-blue mark) is caused by rupture of small blood vessels beneath the skin. *Treatment:* Cold compresses, compression bandage, and rest to the part.

SHOCK. Shock is a general depression of the vital functions of the body following injury of any type. Collapse is extreme, rapid shock occurring with severe injury. The mechanism of shock is debatable and the subject of wide research at present. Essential factors, however, are excessive and rapid blood loss or plasma loss (as in severe burns), with resultant loss of body fluids and essential substances such as chlorides, and changes in blood pressure incompatible with competent circulation. There is insufficient blood supply to the brain and other vital organs. Overexposure and sudden strong emotions, such as fear, are also predisposing causes of shock.

Signs of shock. Temperature often subnormal; pulse weak, rapid, or irregular; skin and mucous membranes pale, and lips and nails bluish colored (cyanotic); skin cold and clammy, with cold perspiration of the face and hands. Breathing shallow, rapid, and feeble—gasping or sighing in character. The pupils may be dilated. The patient may be comatose or greatly apprehensive.

Treatment of shock at the scene of accident. (1) Lay the patient flat on his back with head slightly lowered and feet moderately elevated by pillows or blankets. Reassure him. (2) Keep the patient warm with several light blankets, if possible, but do not smother or weigh him down too much. Hot-water bags may be used, but make sure they are not so hot as to burn his skin. (3) Give stimulating drinks such as hot tea or coffee (not whiskey) if it is determined that there are no injuries of the abdominal organs. (4) Blood or plasma transfusion is often necessary as soon as possible. Meanwhile bandaging the extremities from the fingers and toes inward may often help by confining the available blood in the body toward the center and the vital organs. Move to a hospital quickly as possible. Remember, shock is a frequent cause of death. Prompt first aid

will often save a life. *Don't forget to control any bleeding first of all.*

Fainting (syncope) is a transient loss of consciousness simulating shock without blood loss, usually caused by a sudden emotional upset. The "blackout" is caused by a sudden temporary decrease in the amount of blood circulating in the brain. The patient appears to be in mild shock. **Treatment:** If the patient is sitting when he faints, forcing the head down between the knees is often all that is necessary. If the patient has fallen, loosen the clothing about the neck and place him flat on his back. Allow him to inhale a few whiffs of household ammonia or smelling salts, or apply cold wet towels to the head, face, and neck.

CONCUSSION OF THE BRAIN is a state resulting from violent shaking-up of the brain, and is always caused by trauma, or violence. It is caused either by a direct blow to the head or indirectly from a blow to the face, chin, or spine. A momentary displacement occurs and the entire brain is affected, with first stimulation and then depression of the vital centers of the brain, which are paralyzed in fatal cases. Note that concussion most frequently accompanies fractures or other injuries of the head.

Symptoms of concussion vary with the severity of the injury. *Slight:* Patient is dazed or confused momentarily, and he may or may not fall. There may be slight headache for a time. *Moderate:* He loses consciousness for a short time. Afterward he may be confused for a short time and suffer from headache. *Severe:* Consciousness is lost for a variable length of time. Breathing is shallow and pulse fast. There may be vomiting, and irregularity of the size of the pupils. *Profound:* There is deep loss of consciousness and the vital centers are so severely injured that death frequently follows.

Treatment: None is indicated for the slight cases. In cases of moderate severity the inhalation of ammonia or smelling salts or the application of cold compresses to the face and head help to restore consciousness. *Keep quiet any patient who has received a severe blow or who has been knocked unconscious for any time, until examined by a physician. Treat all the more severe cases as for shock.* The patient should be hospitalized and X-rays taken to rule out fracture of the skull or blood clot formation under the skull or brain coverings. Remember that sudden or gradual appearance of headache or visual disturbances or other sensory difficulties immediately or even some time later following concussion may be indicative of formation of a blood clot within the skull due to slow bleeding from a ruptured vessel.

GENERAL INSTRUCTIONS FOR EMERGENCIES—Procedure at site of accident: Take absolute command of the situation. Keep calm and keep others quiet and from crowding around the injured person(s). Give orders quietly but firmly. Assure the patient, if conscious, that he is receiving proper attention. Send for a doctor or ambulance immediately and be sure that the messenger conveys the exact location of the accident. Determine the extent and severity of injuries. Treat severe ones first. Remove the injured person from the ve-

hicle (if in one) unless fracture is indicated, in which case do not move unless absolutely necessary. Splint fractures wherever the patient lies, if possible. If the person is conscious but cannot move his legs, assume spinal injury. If he is unconscious, assume spinal or head injury and treat accordingly until proved otherwise. Look for shock repeatedly and treat it when noted. It may appear suddenly or imperceptibly. Control any bleeding first. Keep him warm. Do not give anything by mouth to an unconscious person. If there is vomiting, turn the head to one side and keep the mouth clear in order to prevent inhalation of vomitus and consequent strangling. Do not let a relaxed tongue slip back into the throat of an unconscious person; he may choke to death (asphyxiation). Do not allow any severely injured person to walk about; he may aggravate an injury or possible fracture.

BURNS constitute about 25 per cent of injuries in the home. They are caused by *dry heat* (flames and hot objects of all types), *moist heat* (scalds), *electricity*, and *chemicals* (acids, alkalis, inflammable liquids, and excessive external medications). Regardless of the causative agent, burns occur in *three general classifications: first degree*—skin is reddened; *second degree*—blisters form; *third degree*—destruction of deeper tissues by cooking or charring. The extent of surface area involved is more important than depth of a burn. Two-thirds of the body surface burned in the first degree or one-third in second degree may result in death. The danger from extensive burns is, first, shock, due to loss of serum oozing from the injured surface, and, second, infection.

First-aid treatment. *Slight burns:* Apply a protective ointment, such as sterile petroleum jelly, to small first- and second-degree burns, and cover with a clean dressing. *Extensive burns:* If the individual's clothing is afire, throw him down and smother the flames with a rug, blanket, cushions, etc. Rolling up in a rug is best. **Treatment:** cut clothing away from the burned area. Leave any fragments that stick for the physician to remove. *Treat for shock first.* For extensive burns of any area, particularly an extremity, apply petroleum jelly, cover with a clean dressing, and wrap snugly with bandage. This "pressure dressing" method is now considered much better and safer than the old tannic or picric acid methods. Do not apply oils or greases to extensive or severe burns, as they make proper treatment difficult. Always obtain medical treatment immediately.

Chemical burns. Wash both *acid* and *alkali* burns with large amounts of plain water. Then wash an *acid burn* with water containing household ammonia, one tablespoon to the pint. Wash an *alkali burn* with water containing common vinegar or lemon juice, one tablespoon to the pint. After washing, apply a dry sterile dressing.

Sunburn. Avoid more than 10 minutes exposure for the first few times. Avoid more than 2 or 3 minutes exposure to home sun lamps at first. Mild burns cause redness and burning sensation of the skin. Severe burns cause marked redness, with blis-

ters, swelling, pain, and often chills and fever. *Treatment:* Mild sunburn is relieved by application of a mild ointment or lotion. Applications of compresses soaked in solution of soda bicarbonate in water (one tablespoon to a quart) are soothing. Severe sunburn is very dangerous. Treat as for other severe burns, but it is best to see a physician immediately. *Heat stroke or sun stroke, and neat exhaustion:* see article *Sun Stroke*.

Chemical burns of the eye, caused by lye, lime, cement, etc. Hold the eye open and wash out with plenty of lukewarm water. Flush out any solid particles present. Drop some bland ointment or oil such as olive oil or castor oil into the eye, close the lids, apply a clean dressing, and take patient to a physician at once.

FROSTBITE occurs when parts of the body are exposed to freezing temperatures for a long time without proper protection. The nose, ears, fingers, and toes are usually affected.

Recognition: First redness and pain in the involved parts. The part next turns bluish, and finally white and hard. Cessation of pain is a bad sign. *Treatment* is based on gradual return of normal temperature to the affected part. Sudden warming causes extreme congestion, which may later result in gangrene or death of the part. Get the patient indoors but keep him away from the heat. Be gentle in all handling of affected areas. Do not rub with snow; this causes more damage. Simply cover the frozen part with the hand or soft clothing. If a hand is frozen, hold in the armpit or between the thighs, or allow to thaw gradually in cool air or cold water. Do not expose to hot stove or fire.

SNAKE BITES. The common poisonous snakes of this country are the rattlesnake, moccasin, and copperhead, and also the coral snake, in the South. Always carry a snake-bite aid kit while hiking. It should contain a tourniquet, syringe suction cup for extraction of venom, razor blade or sharp knife for incising the bite, antiseptic, and dressing material.

Snake-bite is recognized by pain, swelling, peculiar small hemorrhages under the skin of the area caused by the action of the poison, and the finding of two small puncture marks in the skin caused by the fangs. *Treatment:* Apply a tourniquet immediately above the bite, not to control hemorrhage, but to prevent spread of the poison. Make a criss-cross incision $\frac{1}{2} \times \frac{1}{2}$ in. and $\frac{1}{4}$ in. deep through the bite marks, so that free bleeding will occur. Then apply suction for at least a half-hour. Apply antiseptic (potassium permanganate crystals are good) and dressing, and carry the patient to a physician. Loosen the tourniquet briefly about every half hour. If swelling becomes extensive, make more cross incisions in concentric circles from the original bite, and apply suction. If a vessel is cut, control excess bleeding by pressure. Shock may develop rapidly and must be treated. Give plenty of water by mouth. If no aid kit is available, make the cross incision(s) with a knife, and cauterize the wound with the point heated red in a flame. Apply suction by mouth, making sure that you have no cuts or abrasions about the mouth, and spit out the sucked material and rinse the mouth with water. Get the patient to a doctor as fast as possible to give snake anti-venom serum.

BITES BY POISONOUS INSECTS such as the scorpion, centipede, and certain spiders, if marked by severe swelling, pain, and shock, are treated the same as for snake-bites. Bee stings, etc., are treated by removal of the sting, if visible, with tweezers, and application of cold weak solutions of ammonia or baking soda. Do not squeeze.

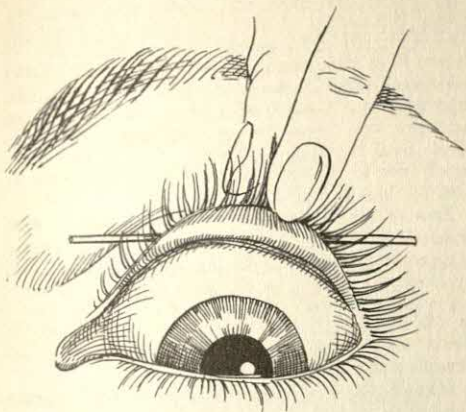
POISONING BY PLANTS is caused commonly by three plants. *Poison oak* is a short stubby plant, with each leaf composed of three leaflets with notched edges, and downy undersurface. *Poison sumac* has a typical leaf structure and white berries (see illustration). *Poison ivy* (three-leaf ivy or poison creeper) is a climbing or trailing plant. Each leaf has three leaflets with wavy edges. The berries are white and waxy.

Poisoning by these plants is recognized by: marked inflammation of the skin, itching and burning, and swelling with often little blisters. *Treatment:* remove clothing contaminated by the oils of the plant. Wash the affected areas with very soapy water. Bathe with alcohol. Apply wet dressings of soda bicarbonate solution. Calamine lotion with 1% phenol is excellent if available.

ATHLETE'S FOOT, or Epidermophytosis, ringworm of the feet and hands, is an infection of the feet and occasionally the hands and other skin surface areas. It is caused by a variety of fungus organisms, especially epidermophytos and trichophytos, and occasionally monilia, a yeastlike mold. The eruption first appears as tiny clear blisters between the toes and on the soles of the feet, with often intense itching or burning sensation. These blisters dry up in a few days and the skin cracks and scales off; then new blisters appear and blend, spreading the infection. Secondary infection with the common bac-

POISON IVY





REMOVING FOREIGN BODY BENEATH UPPER EYELID

teria of the skin may lead to extensive weeping and ulcerative lesions. Allergic effects may cause eruptions on other parts of the body, especially the hands. The infection is commonly spread via swimming pools, bathrooms, and showers. The best prevention is personal prophylaxis. Carefully wash the feet and rinse off all soap (the fungi thrive in an alkaline medium), dry carefully, and wear clean cotton socks with frequent change and disinfection of shoes (exposure to sunlight is excellent). Various fungicidal ointments, and especially dye preparations such as gentian violet and brilliant green, and tincture of iodine ($\frac{1}{2}$ per cent) are useful in treatment, which must be persistent in order to eradicate the disease.

FOREIGN BODIES are such things as insects and bugs, gravel, pins, beads, coins, beans, seeds, splinters, pieces of metal, etc., lodged in the external openings of the body or in the skin. The object must be removed and the injury treated.

Foreign bodies in the eye. Often tears caused by the irritation will wash out a small particle of dust, soot, or an eyelash. Blinking the eye helps. *Do not rub them.* If the particle is under the upper lid, turn it upward over a match stick or cotton applicator and thus turn it inside out, holding it by the lashes (see illustration). If you can see the foreign body, either on the inner surface of the lid or on the eyeball, remove it *gently* with the corner of a clean handkerchief or a small cotton applicator. If the object is under the lower lid, simply grasp the lid by the lashes and pull gently down and out, and remove object, as described above. If you fail the first time, or the object is imbedded in the tissues, *do not try further.* Close the eye, cover with soft compress, and take the patient to a doctor at once. Delay may result in ulceration and loss of the eye.

Foreign body in ear. If an insect, fill the ear canal with mineral oil or glycerin to kill it, then take the patient to a doctor. Never attempt to remove

objects from the ear, not even accumulation of ear wax, as irreparable damage may be done by unskilled hands.

Foreign body in nose, if not too firmly lodged, may often be removed by gentle blowing of the nose. If not, see a doctor immediately.

Foreign bodies in the throat often lodge at the tonsils, especially bone fragments, toothbrush bristles, nutshells, etc. *Do not* eat bread, potatoes, etc., in attempt to dislodge the object; this only causes it to be more firmly imbedded, or swallowed. If the object is large enough to obstruct breathing and is not quickly removed, death may occur. So act quickly. Forceful coughing may dislodge the object, aided by firm slapping on the back between the shoulders. If the object is a large lump of food stuck in the esophagus, it may be pushed further down with the fingers and thus removed by swallowing. If these fail, hold the patient up by the feet, especially a child, and pat firmly on the back. If all methods fail, and the patient is badly choked, keep calm; there is usually time to get a doctor, but hurry.

Foreign bodies in the skin or under the nails, such as wood or metal splinters, are painful, but not usually emergencies. If an end still protrudes above the skin, it may be removed by gentle traction opposite the direction of entry, then treated as for other minor wounds. Unskilled attempts may force fragments deeper, so it is better to get professional attention to avoid infection and give tetanus antitoxin.

ASPHYXIA is suffocation or smothering due to obstruction to respiration and hence oxygen deficiency, and results in death if not soon relieved. Strangling is complete stopping of breathing due to complete obstruction of the air passages. The first-aiders must know the action and physiology of respiration. (See *Lungs; Respiration; Circulation; Anatomy.*) The first-aid fundamentals are to remove the cause of asphyxia and resume normal respiration. If asphyxia has been slight and brief, removal of cause is sufficient; if long and the patient is unconscious, artificial respiration is required (see later).

Asphyxia by foreign bodies, hanging, electric shock. Usually partial asphyxia due to a foreign body is relieved by its removal; the bluish (cyanotic) skin returns to normal color and the labored breathing becomes regular and easy again. In cases of hanging or strangulation by constriction around the neck, cut away the constricting material and institute artificial respiration at once. Watch the patient carefully for a half-hour after he apparently recovers, as he may stop breathing again due to still partial paralysis of the respiratory center, especially in cases of lightning or electric shock. In the latter case the rescuer must sometimes break the contact between the current and the patient, and must protect himself from shock by covering his hands with some non-conducting material such as rubbers, boots, leather belt, etc. It is easiest to shut off the switch if handy.

Asphyxiation from gases, commonly carbon monoxide gas inhaled, occurs in closed places where automobile exhaust gas accumulates, in steel, coke, and oil plants, in mines and in any building or home with leaking illuminating or cooking gas fixtures. Carbon monoxide is particularly dangerous because

it is odorless. *Symptoms* of carbon monoxide poisoning vary with concentration of the gas and physical condition of the victim. Headache, tightness over the forehead, dizziness, impaired vision, slowing of speech, weakness, sleepiness, nausea, and vomiting are common early signs. The face is flushed and lips pink. Remove the patient to fresh air and shut off the source of the gas at once if possible. Start artificial respiration at once, massage the extremities, and apply heat. In mild cases where the patient is conscious mild stimulants are helpful (not alcohol). In severe cases give oxygen by mask if trained personnel and equipment are available.

Asphyxia by drowning is caused by water entering the lungs and shutting off the air. After the victim is removed from the water, water must be emptied from the lungs. To do this, lay him on his face and abdomen, then grasp him around the abdomen just above the hips and lift his body at the hips, so the water will run out the mouth. Then start artificial respiration. Do not roll the patient over a barrel. The mouth-to-mouth method of artificial respiration is preferred, particularly in the absence of help. The victim should be placed on his back and covered warmly. Clear his mouth of foreign matter. Tilt his head back so the chin is pointing upward and push or pull the jaw into a jutting-out position. Place your open mouth over the victim's mouth, at the same time pinching his nostrils shut. Blow air into the victim's mouth, remove your mouth, and listen for the return rush of air. If air exchange does not occur, turn the victim on his side and administer several sharp blows between the shoulder blades in the hope of dislodging foreign matter. For an adult, blow vigorously at the rate of about 12 breaths per minute; for a child, use shallow breaths at the rate of about 20 per minute. Artificial respiration should be continued for as long as necessary, until the victim begins to breathe for himself, or until a physician pronounces him dead.

MEDICAL EMERGENCIES as well as other types require recognition and often essential first aid.

Hysteria is an emotional upset manifested by prolonged loss of self-control, occurring most often in young women. It can be distinguished from epilepsy (*q.v.*) because the latter has no apparent immediate cause such as excitement or other extreme emotion. In hysteria the warning may be palpitation of the heart, the crying out comes during the attack, and the seizure lasts much longer than true epilepsy. Also, the hysterical patient invariably picks out a soft place to fall without injury. Often a sharp slap or cold water in the face will end a hysterical fit. Do not show overconcern for the patient; this may tempt her to further outbursts.

Convulsions commonly occur in infants or children as an early symptom of various acute infectious diseases, severe gastro-enteritis, diseases of the brain and meninges (meningitis), acute gastric upsets, or allergic reactions. *Symptoms*: Sudden onset, spasm of the hands and body muscles, twitching of muscles, head drawn back, flushed face, and finally deep sleep or coma. *Treatment*: During convulsion place child in a warm bath (98-100° F.) and apply an ice bag to his head while in the bath. Call physician to rule out serious illness. If it is known that the attack is due to improper feeding, empty the stomach and give an enema.

Diabetes (q.v.). Sometimes a diabetic develops a condition called *insulin shock*, due either to taking too much insulin or not enough carbohydrate, or

both, with symptoms of trembling, weakness, sweating, mental confusion, and finally convulsions and coma. He usually recognizes the state coming on. *Treatment*: Give the patient orange juice, sugar, or candy. If in coma, rush him to a hospital. The other emergency complication of severe diabetes is *acidosis*, due to lack of insulin, with symptoms of headache, cold dry skin, weakness, prostration progressing to coma, loud breathing, soft eyeballs, and fruity (acetone) odor to the breath. *Treatment*: Rush to a hospital for insulin regulation.

Pain in the abdomen, from slight to severe, generalized, or localized, steady or intermittent, sudden or gradual in onset, may be due to any derangement, dysfunction, disease, or injury of the abdominal organs. Remember that any pain in the abdomen, in child or adult, that is not the direct result of dietary indiscretion, should be considered a serious condition and treated as such.

Do not give any cathartic or enemas (they may cause ruptured appendix and peritonitis).

Renal, or kidney colic, due to kidney stones or infection, is manifested by pain starting usually in the back over the kidney and radiating around the flank downward through the side of the abdomen toward the bladder or groin. Onset is sudden, with pain steady or irregular. There may be associated chills, fever, sweating, nausea, and bloody or darkly discolored urine. *Treatment*: Make patient comfortable, apply hot wet packs to the affected areas, and call the physician.

Distended bladder, due to retention of urine, may be caused by anything obstructing the bladder neck or urethra (tube to the outside). *Symptoms*: Inability to pass urine, and domelike swelling in lower abdomen, with discomfort or pain. *Treatment*: Hot wet compresses over lower abdomen, or sit in a hot bath in effort to release spasm of bladder neck. If the bladder does not then empty, call a physician who will pass a catheter (slender rubber tube) through the urethra into the bladder. Do not try this yourself.

Food poisoning is due to contamination of food by certain bacteria. Meat and contaminated water are the chief offenders. *Symptoms*, due to irritation in the intestines, appear within 48 hours, and are: pain in the abdomen, dizziness, nausea and vomiting, diarrhea, and cold sweat. *Treatment*: Bed rest, no food, take only fluids. So-called *ptomaine poisoning*, due to contaminated pastries and salads, is treated likewise. *Mushroom poisoning* gives similar but more severe symptoms, followed by convulsions, coma, and often death. *Treatment*: Empty the stomach, keep him warm, give cathartic, call doctor at once.

For other types of poisoning see *Poison*.

Fiscal (*fis'kal*), a legal term relating to the finances of a government.

Fiscal Year (*fis'kal yēr*), a legal term designating, in the administration of a government or a corporation, a period of 12 months for which appropriations are made and expenditures authorized. As distinguished from the calendar year which begins with Jan. 1 and ends on Dec. 31, the fiscal year may begin at any time in the year, ending 12 months thereafter. The fiscal year of the Federal and the state governments in the U.S. starts on July 1, ending on June 30 of the following year.

Fischer (*fish'ēr*), EMIL, physicist, born in Euskirchen, Germany, 1852; died in 1919. Fischer began teaching in 1874 and held a number of posts before becoming professor of chemistry at the Univ. of Berlin in 1892. His work in the field of organic chemistry began with his teaching.



Courtesy N. Y. Academy of Medicine

EMIL FISCHER

and, while still an assistant lecturer, he discovered the organic hydrazines and the effect of phenylhydrazines on aldehydes and ketones. On the basis of these discoveries he was able to establish the composition of the various sugars and accomplished the synthesis of grape sugar. Also important were his studies of albumen materials, which laid the foundation for artificial preparation of natural albumens, and his work in the field of lichenic and tanning materials. In 1902 he was awarded the Nobel Prize in Chemistry for his work on synthetic sugar and on the purine groups.

Fischer, HANS, chemist, born in Höchst-am-Main, Germany, July 27, 1881; died in Munich, March 31, 1945. A student of chemistry and medicine, he became a lecturer on medicine in Munich (1911). He left to teach at Frank's Physiological Inst. (1913), and subsequently taught at Innsbruck Univ. (1916) and Vienna (1918) before becoming professor of organic chemistry at the Munich Polytechnic (1921). His research in the structural composition of the coloring matter of blood and of leaves, and his synthesis of hemin, won for him the Nobel Prize for Chemistry in 1930.

Fish (*fish*), a group of vertebrate animals which live in water and breathe by gills. They are distinguished by having paired fins and by not breathing by lungs in any stage of life. Their

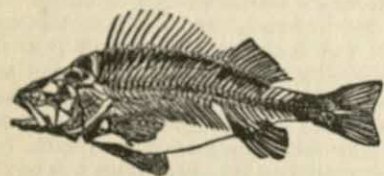
form is well adapted to permit them to move easily and rapidly through the water, tapering toward the extremities, but exceptions are numerous. The typical character of the skeleton is evidently homologous with those of quadrupeds and man. The four limbs belonging to the usual structure of vertebrate animals assume the forms of fins. Fins, gills, and, most generally, scales are distinguishing features of fish. The heart contains only one auricle and one ventricle, receiving venous blood only, and sending it to the gills, where it is oxygenated and passed by the dorsal vessel into the greater and only circulation. Fish, with few exceptions, are cold-blooded animals; that is, they have a temperature little above that of the water in which they live. When taken from the water they die in consequence of the drying up of the fine fringes of the gills.

In most fish the gills are situated at the back part of the sides of the head, usually four on each side, and consist of folds of membrane attached to the surface of the gill cavities, or a multitude of vascular membranous plates, generally in double fringed rows fixed by the base. The gill orifices are covered by a bony plate whose motion expels the water, which is taken in by the mouth to supply the gills with air. Fishes possess nerves and organs of all the senses, although the senses of touch and taste are dull compared with those of many other animals. Some fish are destitute of sight, but most species have large eyes and a very acute vision. Others have no teeth, but many species have a large number. The air bladder, an organ aiding them to maintain an equilibrium in the water, is found in many kinds.

Fishes reproduce by means of *spawn*, or *eggs*. In some species, these are fertilized in the body of the female; in others, fecundation takes place at the time when or after they have been extruded. The eggs are usually deposited in sand or gravel where the water is shallow. Many species leave the depths of the ocean and pass into fresh water for this purpose. A single codfish is said to lay 9,000,000 eggs. As a rule, they show no parental care either for their eggs or young, but some species build nests and watch over them. Fish, being cold-blooded, need no covering for warmth; hence, the scales serve for protection or as a defensive armor. While the skin of cartilaginous fish yields shagreen and the bladder of some fishes isinglass, by far their most important use consists in supplying man with food.

Many species known as *deep-sea fish* are very peculiar and formerly were not known to exist. Many of them have no eyes, because sunlight is absent from the depths at which they thrive. Their peculiar structure enables them to withstand the low temperatures and enormous pressures that are common at great depths. They live almost, if not entirely, upon animal life, as plants

do not grow without the influence of sunlight. Many of the species have extended mouths and dilatable stomachs, which enable them to swallow and digest bodies much larger than themselves, or strain out material from sediment that settles down from above. The fins and tail are long and delicate, because of the perfect calm at such depths. See *Fins; Fish Culture*, and color plates, *Marine and Fresh Water Fish I and II*, Volume V; *Ocean Life Among the Coral Reefs of the Tropical Pacific I, II, and III*, and *Tropical Aquarium Fish*, Volume VIII.



SKELETON OF A FISH

Fish, HAMILTON, statesman and diplomat, born in New York City, Aug. 3, 1808; died in Garrison, N.Y., Sept. 7, 1893. He was graduated from Columbia Coll. in 1827, studied law, and in 1830 was admitted to the bar. In 1843 he was elected to Congress as a Whig, serving in the lower house until 1845. He was lieutenant governor of New York (1847-49), served as governor of the state (1849-51), and was a member of the U.S. Senate (1851-57). During the Civil War he served on the Union Committee in New York City. He was Secretary of State during Pres. Grant's administration (1869-77), and played a major role in several international disputes including the San Juan Boundary Dispute and the "Alabama claims."

Fish, HAMILTON, ex-congressman, born in Garrison, N.Y., Dec. 7, 1888, grandson of Hamilton Fish (q.v.) and son of Hamilton Fish (1849-1936). He was graduated from Harvard in 1910 and served as a member of the New York State Assembly (1914-16). Elected to the U.S. House of Representatives from the 26th district of New York State in 1920, on the Republican ticket, he held his seat in Congress until 1945. Before the Japanese attack on Pearl Harbor, he championed American isolation from international conflicts. A protagonist in anti-Soviet movements, he wrote "The Challenge of World Communism" (1946).

Fish, STUYVESANT, capitalist, son of Hamilton Fish (q.v.), born in New York City, June 24, 1851; died there Apr. 10, 1923. He was educated at Columbia Univ. and in 1871 became a clerk in the New York office of the Illinois Central R.R. The next year he became secretary to the president of that company, was made a director in

1876, and held other important offices with other railroad companies. He was president of the Illinois Central (1887-1906), and did much to extend its lines and build up its business interests. His book, "The Nation and the Railways," was published in 1908.

Fishbein (*fish'bin*), MORRIS, physician, editor, lecturer and writer, born in St. Louis, Mo., July 22, 1889. He attended the Univ. of Chicago and received his M.D. from Rush Medical Coll. in 1912, remaining there for a year as a fellow in pathology. This was followed by a year at the McCormick Inst. for Infectious Diseases (1913-14). In 1913 he became assistant editor of the *Journal of the American Medical Association* (A.M.A.) and in 1924, its editor. As a leader in the A.M.A. he directed the Association's opposition to compulsory health insurance. A popular speaker and prolific writer, he has lectured throughout the U.S. and contributed a great number of articles to scientific and medical publications. He edited the "Modern Home Medical Adviser." His other publications include "Frontiers of Medicine" (1933), "The National Nutrition" (1942), and "History of the American Medical Association" (1947). In 1949 the A.M.A., which was engaged in an intensified campaign against compulsory health insurance, announced that Fishbein would be retired as soon as he could train successors to take over his duties. In the meantime he was restrained from speaking on "controversial topics."

Fish Culture (*kū'tūr*), the industry embracing the education and labor devoted to the growth and propagation of fish. The ancient Egyptians and Chinese were highly skilled in pisciculture and gave it marked attention, because the subsistence of large masses depended upon the food-producing qualities of their interior and adjacent waters. The art may be traced through successive centuries. The industry now yields vast benefits to the people of Western Europe and America. The habit of large fish feeding on smaller, and the latter on eggs, tends to depopulate the waters.

The discoveries made by Stephen Ludwig Jacobi, of Westphalia, Germany, in 1763, led to the art of increasing fish by stripping the females of their eggs and fertilizing them by the milt taken from the male fish. From this discovery and those made later by L.J.R. Agassiz it became possible to breed and rear fish more extensively than had been possible previously, and by skillful application and care to preserve, feed, and fatten them. As a result, waters before unproductive have been populated with various species, such as the California salmon, California brook trout, char, whitefish, shad, and German carp. Many streams and lakes have been populated with fish, as the shad, which has been planted in the rivers of Georgia, and the white-

fish fry has been introduced in Lake Erie. Besides, the waters of California, Canada, and many European countries have been restocked.

Much advancement has been made in fish culture in the U.S., where it is now pursued more extensively than in any other country. The industry is under the jurisdiction of the U.S. Fish Commission, a bureau established by act of Congress, Feb. 9, 1871. The primary object originally was to investigate the food fish of the seacoast and inland waters of the U.S. Since then the duties of the bureau have been widely extended, and the whole now constitutes one of the most important functions in the service of the government. Many valuable reports and bulletins have been distributed annually, relating to various phases of the industry. They have been instrumental in disseminating accurate and scientific knowledge of the art. The several states have been supplied with various kinds of fish, the annual distribution often aggregating 200,000,000 eggs and fish, of which three-fourths are infant and adult fish and about one-fourth are eggs. At colleges of agriculture and other institutions under state and Federal control, the industry has been carefully studied. Along with fish culture proper, the artificial culture of lobsters, oysters, and other crustacea is increasing.



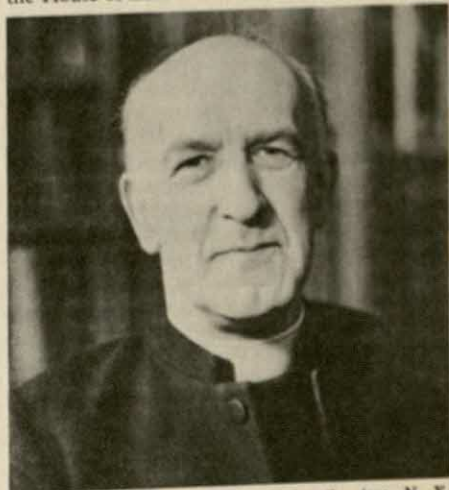
Courtesy Harcourt, Brace & Co., N. Y.

DOROTHY CANFIELD FISHER

Fisher (*fish'ēr*), DOROTHY CANFIELD, author, born in Lawrence, Kans., Feb. 17, 1879; died in Arlington, Vt., Nov. 9, 1958. She studied at Ohio State and Columbia universities. In 1907 she married John Redwood Fisher. A former schoolteacher, she was active in child welfare; her interest in the education methods of Maria Montessori (*q.v.*) resulted in "A Montessori Mother" (1913). Other books were "Why Stop Learning?"

(1927) and "Fables for Parents" (1937), but the bulk of her output was light fiction. In 1931 she became a member of the National Inst. of Arts and Letters. Her best-known books include "The Squirrel Cage" (1912), "The Bent Twig" (1915), "The Brimming Cup" (1921), "The Deepening Stream" (1930), "Seasoned Timber" (1939), and "American Portraits" (1946). Her love of New England is reflected in "Vermont Tradition: The Biography of an Outlook on Life" (1953), and "Memories of Arlington, Vermont" (1957). Her last book was "Pebble in a Pool" (1958).

Fisher, GEOFFREY FRANCIS, archbishop of Canterbury, born in Higham-on-the-Hill, Nuneaton, May 5, 1887. Educated at Exeter Coll., Oxford, and Wells Theological Coll., he became a deacon in 1912 and a priest in 1913. He was assistant master of Marlborough Coll. (1911-14) and headmaster of Repton School (1914-32). He served as bishop of Chester from 1932 to 1939, when he was made bishop of London. In 1945 he was enthroned as archbishop of Canterbury. In 1960 Dr. Fisher visited Pope John XXIII, the first meeting between the heads of the Anglican and Roman Catholic churches since the Church of England-Vatican split in 1534. He retired in 1961, becoming a life peer and retaining his membership in the House of Lords.

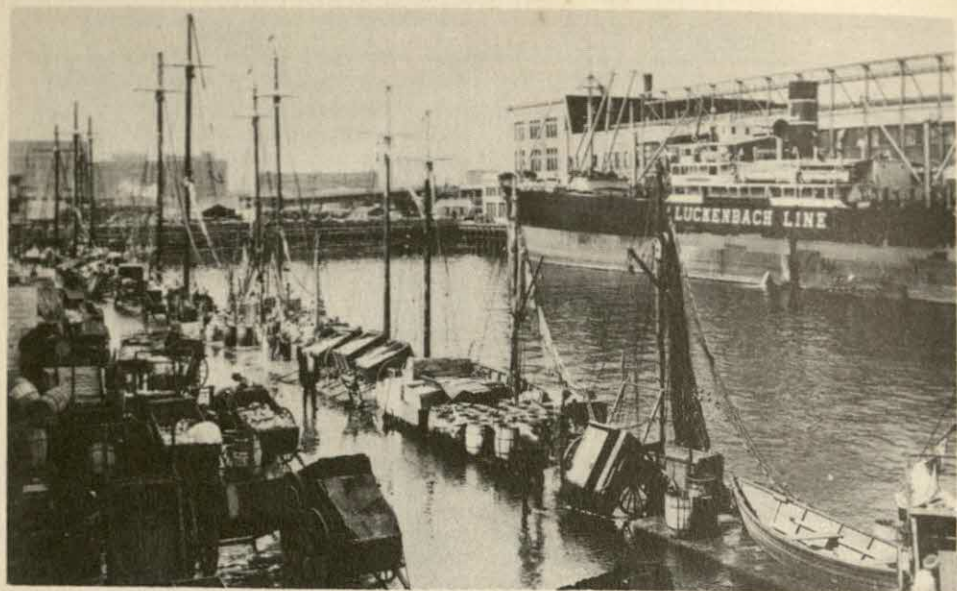


Courtesy British Information Services, N. Y.

GEOFFREY FISHER

Fisher, GEORGE PARK, clergyman and historian, born in Wrentham, Mass., Aug. 10, 1827; died Dec. 20, 1909. He attended school at Wrentham and was graduated from Brown Univ. He was one of the leading Congregational clergymen and church historians of the U.S.

Fisher, HARRISON, illustrator, born in Brooklyn, N.Y., July 27, 1887. He studied in California and Europe and became an illustrator for



Courtesy Massachusetts Development & Industrial Com.

FISH PIER AT BOSTON, MASS.

A large portion of the fish consumed in the U. S. is landed on this dock, the largest pier in the world devoted exclusively to handling fish

many periodicals. He died January 19, 1934.

Fisher, HARRY C. (BUD), cartoonist, born in San Francisco, Calif., April 3, 1884; died in New York City, Sept. 7, 1954. His sports cartoon about "A. Mutt" appeared at unscheduled intervals until 1907, when it began to appear daily. In 1910 "Jeff," a second character, was added to the comic strip, which became known as "Mutt and Jeff." The third oldest in the U.S., this strip was the first to appear in horizontal form, previous comic strips having been published vertically. Fisher also appeared in vaudeville and on the screen.

Fisher, JOHN ARBUTHNOT, 1ST BARON, admiral, born at Rambodde, Ceylon, in 1841; died in 1920. After naval service in the Crimean, Chinese, and Egyptian wars, he was lord of the admiralty (1892-97), first sea lord (1904-10), and admiral of the fleet (1905-20). Recalled from retirement as first sea lord in 1914, he greatly increased British naval strength and efficiency for World War I. He resigned in 1915. His memoirs, titled "Reminiscences," appeared in 1919.

Fishery (*fish'ē-ry*), the business of catching fish or other aquatic animals, but relating also to the locality where marine life and fish are found in paying quantities. The objects for which fishing is conducted include pearls, corals, sponges, whales, turtles, shellfish, seals, and many others, besides the various species of fin fish. Among the chief methods of fishing are those employing drawnets, spears, lines, and dredges. The most important of the fresh-water fisheries include

those of the salmon, in which sportsmen employ fly hooks, while fishers generally use stakenets and drawnets. Other important fresh-water fish include the perch, eel, trout, pike, and catfish. Measured from the standpoint of profit, the oyster, cod, herring, and haddock are the most productive sea fisheries. Countries bordering on the sea naturally possess the most valuable fisheries, among which Canada and the U.S. rank high.

Disputes regarding fishery rights have taken on the form of international questions, and have occupied the attention of diplomats, especially those involving the U.S. and Great Britain at different times. The Bering Sea question, which occupied the attention of both governments for some time and attracted particular attention in 1896, is one of the most important. Under the fishery laws the owner of the soil and streams, or bodies of water, is entitled to the exclusive right to fish in such water. Where the owner has land adjacent to both sides of the stream, he enjoys the sole right to fish in the entire stream lying between his property, and, where his possessions are only on one side, his right extends to the center of the stream. In streams and bodies of water belonging to the state or Federal government the right to fish is abridged or authorized by general laws. In many of the states fishing is strictly prohibited, except at certain periods of the year, even in bodies of water belonging to private owners, while in some it is made unlawful to fish with drawnets and to use more than two or three hooks on a line. Such legislation is deemed necessary

FISH HAWK

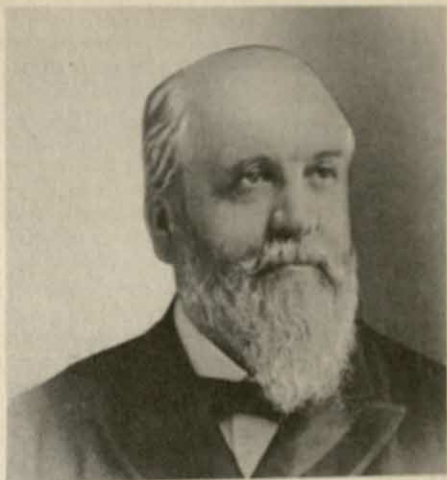
in order to protect the waters from being totally depopulated, and to preserve a fair aggregate of the different kinds of fish at all times. Besides, damaging influences, such as dams, discharged sewage, and other unwholesome and obstructive agencies, are prohibited under suitable penalty, and officers are assigned to prosecute investigation for proper protection.

Newfoundland has some of the most valuable fisheries in the world, especially in cod, herring, and haddock. The Great Lakes yield whitefish, sturgeon, and Michigan herring. Salmon are caught in large numbers on the Pacific coast, especially at the mouths of the Fraser and Columbia Rivers. Manitoba and Minnesota are especially noted for the fisheries in hundreds of lakes. Rapid transportation by railways has made it possible to supply many sections of the country with fresh fish, even in the summer season.

Fish Hawk (*fish' hae*), an eagle or other rapacious bird which preys upon fish, as the bald eagle or the osprey. This genus of birds is widely diffused, being found both in warm and cold climates, and is grouped with the family Falconidae. It is singular among the falcons in preying exclusively upon fish, and to this end its whole structure and habits are adapted. The fish hawk is about 22 in. long, and has a dark brown color variegated with gray and white. It has a short, broad, rounded bill, a long tail, expansive wings, and remarkably rough scaly, pointed toes, suitable for grasping its slippery prey. The feathers are destitute of supplementary plumes and very oily. These birds are found near the sea, lakes, or rivers, and are everywhere birds of passage, going toward the warmer zones soon after the appearance of frost. They catch their prey by diving into the water and grasping it with the talons.

Fishplate (*fish'plāt*), a steel or timber plate used in making a fish joint. Rigidly bolted to each of the members and covering the joint, it is generally used in joining the rails of a railway track or permanent way, and in connection with heavy timber construction.

Fisk (*fisk*), CLINTON BOWEN, soldier and educator; born in Greigsville, N.Y., Dec. 8, 1828; died July 9, 1890. His parents removed to Michigan in 1830, where his father founded the town of Clinton. After studying at Albion and Ann Arbor, he settled in business in Coldwater, Mich., and later in St. Louis, Mo. In 1861 he entered the Union army, was promoted successively until he attained to the rank of brevet major general, and became a commissioner of the Freedmen's Bureau. Later he founded Fisk Univ. at Nashville, Tenn., an institution for the education of colored men and women, of which he was president until his death. Numerous educational and religious institutions received the benefits of his munificence. In 1888 he was nominated for President of the



Courtesy Brown Bros., N. Y.

CLINTON B. FISK

U.S. by the Prohibition party and received about 250,000 votes at the polls on election day.

Fisk, JAMES, stock manipulator, born at Pownal, Vt., in 1835; died in 1872. First a partner in the dry-goods house of Jordan, Marsh & Co., Boston, he gained wealth through government contracts in the Civil War; with Daniel Drew he formed the Fisk & Belden Brokerage Co. in New York (1866). At the same time, he also purchased steamship interests. Manipulations of stock of the Erie R.R., of which Fisk was vice president, increased his wealth but resulted in court charges of bribery. Fisk's spectacular attempt to corner the world gold market (1868-69) with the aid of Drew and Jay Gould was frustrated by President Grant, who released government gold. Fisk was shot in an argument with a friend.

Fiske (*fisk*), BRADLEY ALLEN, American admiral and inventor, born at Lyons, N.Y., in 1854; died in 1942. After graduating from the U.S. Naval Acad. (1874), he saw service off the coasts of Chile and Brazil (1894), in the battles of Manila Bay (1898), and San Fernando (1899); in the latter year he became a captain. As commander of three Atlantic Fleet divisions and aide for naval operations, he was promoted to rear admiral (1912), retiring in 1915.

His most important invention was a naval telescopic sight which greatly increased the accuracy of fire power. Other inventions include: a range-finder, range-indicator, torpedo-plane, electrically controlled turrets, and a system for controlling moving ships by wireless.

Fiske, JOHN, historian and lecturer, born in Hartford, Conn., Mar. 30, 1842; died July 5, 1901. In 1863 he was graduated from Harvard Univ., studied law, and lectured at Harvard on philosophy and history. While attending that institution he was assistant librarian. He became recog-

nized as a deep and forceful thinker and a powerful lecturer, by which he attracted the attention of both Darwin and Herbert Spencer. His special subjects in writing and lecturing were evolution and history, two themes in which he took marked interest. He lectured on American history at the Univ. Coll. and Royal Institute of Great Britain in the winter of 1879-80. After returning to America, he was appointed professor of American history in Washington Univ., St. Louis, though he made his home at Cambridge, Mass. His contributions to the subject of evolution attracted widespread attention, while those relating to the history of America are thoughtful, scholarly, and imperishable. Among his publications on *evolution* are: "Myths and Myth Makers," "Destiny of Man," "Excursions of an Evolutionist," "Outlines of Cosmic Philosophy," and "Idea of God as Affected by Modern Knowledge." Those relating to *history* include: "A History of the U.S. for Schools," "The War of Independence," "Beginning of New England," "American Political Ideas," "Civil Government of the U.S.," "Essays, Literary and Historical," and "Critical Period of American History."

Fiske, MINNIE MADDERN, actress, born in New Orleans, La., in 1865; died in 1932. She came from a family of stage people, her father being Thomas Davey and her mother Lizzie Maddern, and in 1890 she married Harrison Grey Fiske. At the age of three years she appeared as the *Duke of York* in "Richard III" at Little Rock, Ark., and although she devoted much time to the stage her general education was carefully supervised. In New York she played successfully in "Hunted Down" and in "King John," and she toured in many parts of the U.S. After her mar-

riage she retired from the stage for rest and study for three years, after which she again followed stage life. She attained a reputation as a powerful actress in pretentious plays, and was particularly strong in sustaining emotion. Plays in which she succeeded best included: "A Doll's House," "Marie Delroche," "Cesarine," and "A Light from St. Agnes."

Fission (*fish'un*), a division into parts or a splitting. In *astronomy*, the theoretical separation of a semi-liquid star into two stars which revolve about each other. In *biology*, the division of a cell into two separate cells. See *Asexual Reproduction*. In *chemistry* and *physics*, the cleavage of an atom (*q.v.*) into two atoms by the bombardment of the original atom with neutrons. See also *Uranium*.

Fit (*fit*), a sudden, temporary seizure of illness or disease, usually accompanied by convulsions. The word is used to describe an outburst of rage, or a passing mood or manifestation. See also *First Aid*.

Fitch (*fich*), JOHN, inventor, born in South Windsor, Conn., Jan. 21, 1743; died (by his own hand) in 1798. He was the son of a farmer, secured a common school education, and went to sea at 17. Later he became successively, a clock-maker, brass founder, and silversmith. Subsequently he served as deputy surveyor in Kentucky, and in 1786 founded a company for experimenting in steam navigation. He built a steamboat for conveying passengers on the Delaware, which developed into a successful enterprise, though the immediate undertaking proved a losing one and caused the dissolution of the company. In 1793 he went to France to introduce his invention, but met with no success. On returning to America he found that squatters had settled on his property purchased in Virginia, while his invention brought him nothing but disappointment and poverty, which finally led to his sad death. The steamboat built by Robert Fulton was declared by a committee appointed in 1817 to be practically the same as the one John Fitch patented in 1791.

Fitch, WILLIAM CLYDE, author and playwright, born in New York City, May 2, 1865; died Sept. 4, 1909. He was graduated from Amherst Coll. in 1886 and gave his attention to literature. His first story, "The Knighting of the Twins," was published while he attended college, and in 1890 his "Beau Brummel" was brought out at Madison Square Theater by Richard Mansfield. He not only wrote many dramas, but adapted a number of plays from the German and French. Among his productions are: "Her Great Match," "Nathan Hale," "The Masked Ball," "The Moth and the Flame," "The Cowboy and the Lady," "The Woman in the Case," "Her Own Way," and "Captain Jinks of the Horse Marines," which gave

MINNIE FISKE

Courtesy Brown Bros., N. Y.



Ethel Barrymore (*q.v.*) her first starring role.

Fitchburg (*fich'bērg*), one of the county seats of Worcester County, Massachusetts, on the Nashua River; 50 m. n.w. of Boston. It is on the Boston & Maine and the New York, New Haven & Hartford R.R.'s. It is the seat of the Fitchburg Historical Society museum, containing rare exhibits of 16th and 18th century Bibles, and a State Teachers Coll. Manufacturing establishments include iron foundries, machine shops, cotton, woolen, flour, and paper mills, and shoe and shirt factories. Fitchburg, settled in 1719, was part of Lunenburg until 1764, and was incorporated in 1872. Population, 1950, 42,691.

Fitzgerald (*fīts-gēr'ald*), county seat of Ben Hill County, Georgia, on the Seaboard Air Line and other railroads. The surrounding country is agricultural. Fitzgerald has railroad shops and foundries and is a commercial center. It was incorporated in 1897. Population, 1940, 7,388; in 1950, 8,130.

Fitzgerald, EDWARD, poet, born near Woodbridge, England, Mar. 31, 1809; died June 14, 1883. His wide reading caused him to be attracted to Spanish and Persian literature. This bore fruit in his translations of "Six Dramas of Calderon." In 1859 he published his translation of the "Rubáiyát," written by Omar Khayyam. The last mentioned is his greatest work and went through many editions.

Fitzgerald, FRANCIS SCOTT KEY, novelist, short-story writer, and scenarist, born at St. Paul, Minn., Sept. 24, 1896; died in Hollywood, Cal., Dec. 21, 1940. His writings epitomized the "lost generation" of young men in the postwar decade of the '20's. Fitzgerald was educated at St. Paul Acad., Minnesota; Newman School, New Jersey, and at-

F. SCOTT FITZGERALD

Courtesy Brown Bros., N. Y.



tended Princeton Univ. He was a second lieutenant in World War I. This chronicler of the jazz era caught the tempo of his age in such books as "This Side of Paradise" (1920), "Tender Is the Night" (1934), "The Great Gatsby" (1925), and an unfinished novel published posthumously (1941), "The Last Tycoon."

Fiume (*fě-ōō'mā*), a seaport on the Adriatic Sea, at the mouth of the Fiumara River, in the province of Venezia Giulia e Zara. It has a fine harbor on the Gulf of Quarnero and has convenient railroad facilities. The manufactures include paper, tobacco, machinery, soap and clothing. Among the principal buildings are a municipal theater, a naval academy, the town hall, and the Church of St. Vitus. It has a large interior and foreign trade. Fiume was a town of the Byzantine Empire. It became a possession of Austria in 1471, and in 1870 was made a part of Hungary. Fiume was a point of contention at the Paris Peace Congress in 1919, when both Italy and the Yugoslavs laid claim to it by force of arms. A treaty signed in Rome in 1924 awarded Fiume to Italy, with Yugoslavia retaining certain port privileges. After World War II it was again a point of contention, and Fiume was transferred to Yugoslavia under the terms of the Italian peace treaty. Its name was changed to Rijena. Population, ca. 54,000. See also Trieste; World War II.

Five Forks (*fiv fōrks*), a junction of roads in Dinwiddie County, Virginia, where the last important Civil War battle was fought on April 1, 1865. With the Confederate forces lined up to defend Richmond, Gen. Grant planned to cut them off from Petersburg and sent Generals Sheridan and Warren to attack the Confederates' left flank where Gen. Pickett was stationed. After being driven back on March 31, Sheridan successfully attacked Pickett's position at Five Forks the next day, routing Pickett's forces and taking 5,000 prisoners. As a result, both Petersburg and Richmond were evacuated by the Confederates.

Five Civilized Tribes (*fiv sīv'ī-līzd tribz*), a collective designation for the Cherokee, Chickasaw, Choctaw, Creek, and Seminole Indian tribes. Originally inhabiting the southern region of the U.S., these tribes were all advanced in civilization when the white man arrived and quickly adopted his institutions, such as written language, schools, codified laws, and constitutional government, for their own tribal societies. Hence the term "five civilized tribes" was applied to them in 1876, and it became an official designation. See also separate articles on individual tribes.

Five Nations (*fiv nā'shūnz*) See *Iroquois*.

Five-Year Plan (*fiv-yēr plān*), a system of economic planning inaugurated by the Union of Soviet Socialist Republics (*q.v.*) in 1928 and since used by China and the Russian satellites to socialize and industrialize their economies. It has also

been employed in modified form by non-Communist countries to facilitate their industrial development. Under such a system, goals for developing a nation's economy are set in progressive stages, with five years allowed for the accomplishment of each stage. In Russia, the first five-year plan (1928-33) was aimed at nationalizing private enterprise, including the private traders and small businessmen who had been permitted to operate during the first years of Communism, as well as the kulaks, or prosperous peasants. It also proposed to build up the industrial capacity of the hitherto agrarian Russian economy. The plan was considered completed almost a year ahead of schedule, but the progress had been accompanied by severe hardship. In agriculture, collective farms were established and millions of peasants were forced into these collectives; this was done despite tremendous peasant resistance, resulting in a sharp drop in agricultural output in 1931-32 and widespread famine in 1932-33. Providing basic materials for an industrial economy, the production of coal, oil, iron, steel, and copper were doubled from 1927-28 to 1932, but at the expense of consumer-goods production.

The objective of the second five-year plan (launched in 1934) was essentially to continue and extend the collectivization and industrialization already begun. The plan also proposed to double the national consumption level, but it fell far short of this goal, although production in heavy industry was increased beyond expectation and collectivization widely extended.

The third plan (1938-42) set itself the task of overtaking and surpassing capitalist countries in technical perfection and volume of output. Emphasis was to be put on armament, and industrial production was to be raised by 13.5 per cent annually. The outbreak of World War II interrupted Russia's plans during this period.

The fourth five-year plan (1946-50) aimed at reconstructing the Russian economy and restoring prewar levels of production. According to Soviet reports, industrial production at the end of the plan was actually 75 per cent above the 1940 level.

The fifth five-year plan proposed extensive improvements in transportation facilities and a 35 per cent rise in real wages, effected partly by lowering prices. General production, which was to be raised by 70 per cent during the period, was reportedly raised by 85 per cent, although farm production fell below its target.

A sixth plan (1956-60), aimed at increasing over-all production by 65 per cent and agricultural production by 100 per cent, was abandoned at the end of 1958 and replaced with a seven-year plan (1959-65). This new plan sought to increase industrial production by 80 per cent. In

heavy industry, production increases were to run higher—about 85 per cent to 88 per cent. Agricultural production was to be increased by 70 per cent and consumer-goods production by 62 per cent to 65 per cent. According to this plan, the Soviet economy was to be expanded at a rate of 8.6 per cent annually, in contrast to the annual growth rate of *ca.* 2 per cent to 3 per cent for the U.S. economy. Supposing the Russian economy to live up to expectations, Soviet officials predicted that their national production would pass that of the U.S. by 1970.

Fixative (*fik'sa-tiv*), in the *textile industry*, a substance which is capable of holding dyes and pigments, and mordants, permanently on fibers, or temporarily until some desired reaction takes place. In *perfumery*, substances which prevent too rapid volatilization of odors. In *photography*, an agent which prevents further light action on light-sensitive materials. In the *fine arts*, a quick-setting transparent lacquer to protect painting, drawings, etc., from injury by abrasion.

Fixing Salt (*fiks'ing salt*), in photography, an agent which dissolves out the unaffected light-sensitive material and leaves the image "fixed." Sodium thiosulfate, commonly called "hypo," and potassium cyanide are usually used.

Fjord (*fjord*) or **FIORD**, a long and narrow arm of sea reaching far inland and flanked by

TAFJORD, NORWAY

An avalanche swept down to this fjord in 1935, wiping out a village that lay on the bank

Norwegian Official Photo



precipitous sides. Fjords occur exclusively around the Polar regions and are most numerous in Norway, Iceland, Scotland, Greenland, Alaska, and in many Antarctic islands. There are various theories attempting to explain the formation of fjords, but it is generally accepted that sea erosion, glacial action, and river denudation alone do not account for these phenomena. The most probable explanation is that the region experienced faulting and regional uplift, resulting in increased river activity. This occurrence must have taken place sometime before the glacial period (*q.v.*).

Flag (*fläg*), in botany, name popularly applied to a species of the genus *Iris* and to other plants having the same sword-like foliage; they usually grow in moist places.

Flag, a piece of bunting or other material capable of being extended in air, used as a distinguishing emblem or as a signal. Flags may be made in a variety of shapes and sizes, which, together with the impressed designs, identify their nationality, rank, purpose, etc. The Egyptians originated the idea of standards early in their history. This is indicated by inscriptions on ancient sculptures and temples. That the Greeks and Romans used the custom of adopting standards and ensigns is clearly borne out by the *gonfalon*, which was borne in the Roman army near the commander-in-chief during an engagement. In the Middle Ages the *pennon* was used by a knight, while the *standard* was used by distinguished persons. The cross appeared in the banners of the Crusaders.

The flag of Denmark is the oldest among European standards. It is red with a white cross and dates from the 13th century. The union of the three crosses of St. George, St. Andrew, and St. Patrick first designated the union of Scotland with the kingdom of Great Britain, and later it symbolized the union of that kingdom with Ireland. It is known as the *union jack*. The same device, when placed in the first quarter of a white field divided by the Cross of St. George is known as the White Ensign, and is the official flag of the Royal Navy. The Royal Standard, traditionally the banner of the ruling house, is a quartered field, one quarter blue, one quarter yellow, and two quarters red, bearing the insignia of Ireland, Scotland, and England. The flag of the U.S. is the third oldest flag and was adopted before either the British or the French flags.

All nations and many sovereigns, states, principalities, and provinces have flags, usually bearing a more or less decorative field in commemoration of some historic event.

Flags are borne on ships to designate the country to which they belong and to indicate the rank of the commanding officer. The regiments of an army are distinguished from each other by the flags they bear. A yellow flag borne on a vessel

denotes quarantine and a red flag, that powder has been taken on board. A white flag is by the consent of all nations a flag of truce (*q.v.*), and a vessel bearing such a flag is met by a vessel or boat under charge of a commissioned officer bearing a white flag. When a flag flies at half the height of the staff on land or at half the mast of a ship it indicates mourning. A flag is lowered as a mark of respect for a superior officer. To indicate distress, it is turned upside down. Aside from their use as symbols and to designate certain officers, flags serve an important purpose in mercantile and national navies as signals by which to communicate. They are used extensively for weather, railway, survey and other signals. On U.S. ships the *ensign* (as the flag is called aboard ship) is flown above the captain's quarters in recognition of his rank. On U.S. naval vessels the flag is flown both day and night and even on Memorial Day it is half-staffed only when the salutes are fired. In the U.S. Army the flag is never half-staffed after noon.

In America, the Colonies used the British flag before their separation from England, though several others had been proposed early in the agitation for separation. The first was one bearing the inscription "Join, or die," and, when resistance to the British grew stronger, a flag bearing a rattlesnake was designed, bearing the motto "Don't tread on me." Canada continues to use the imperial flag of Great Britain, but it also has a banner of its own, the Federal flag of Canada.

The present national flag of the U.S., *the Stars and Stripes*, is said to have been designed by Betsy Ross (*q.v.*). On June 14, 1777, the Continental Congress resolved that "the flag of the U.S. be 13 stripes, alternate red and white, and that the union be 13 white stars on a blue field." Congress changed the flag to 15 red and white stripes and 15 stars in 1794, but in 1818 an act was passed by which the original 13 stripes and 15 stars were restored, as the addition of a new stripe for each additional state would make the flag unwieldy. At that time, it was provided that the 13 horizontal stripes, which represent the 13 original states, should be continued, while a new star should be added to the number with the admission of a new state into the Union, the addition to take effect on the Fourth of July next succeeding the admission. The first flag under this law was hoisted over the capitol of the U.S. in 1818. It remains unchanged, except as to the number of stars.

The various customs and rules covering the use and display of the flag of the U.S. of America have been codified by Act of Congress. The procedure to be followed during the ceremony of hoisting or lowering the flag or when the flag is passing in a parade or review, is prescribed by law as follows:

"All persons present should face the flag, stand at attention, and salute. Those present in uniform should render the military salute. When not in uniform, men should remove the headdress with the right hand holding it at the left shoulder, the hand being over the heart. Men without hats should salute in the same manner. Aliens should stand at attention. Women should salute by placing the right hand over the heart. The salute to the flag in the moving column should be rendered at the moment the flag passes."

The pledge of allegiance, made official in 1942 and reworded by Congress in 1954, follows: "I pledge allegiance to the flag of the United States of America and to the republic for which it stands, one nation, under God, indivisible, with liberty and justice for all."

As a symbol of national sovereignty, the flag has often figured in dramatic incidents, as, for example, in the raising of the flag on Mt. Suribachi, Iwo Jima, during World War II (see *Marine Corps*).

See also color plates, *State Flags and Flowers I-III*, Volume XI.

Flag Day, the day (June 14) commemorating the resolution of the Continental Congress authorizing the flag of the U.S., June 14, 1777. Not until 1897, when the governor of New York ordered the flag displayed on all public buildings, did the day have more than local significance. Flag Day is a legal holiday only in Pennsylvania, but a 1949 law calls for its national observance by Presidential proclamation. See also *American's Creed*.

Flagellant (*flāj-ē-lant*), a member of a Christian movement of the late medieval period. The movement may have arisen from the custom of public flogging as punishment or imposed penance in the Church. The characteristic processions, singing penitential songs and scourging themselves, were noted in Northern Italy in the 13th century. Led by priests and arousing great fervor in a populace terrorized by poverty, famine, and political struggle, the processions were welcomed throughout the Rhine area and spread into Bohemia. Suppressed, the movement later reappeared, during the time of the Black Death (1348), in other parts of Western Europe. Pope Clement VI denounced it in 1349. Reaching a peak about 1414, despite opposition from Church and secular authorities, the flagellant movement finally became a cult accepting teachings on salvation contrary to those of the Church, and the Council of Constance denounced it as heretical. Some of the leaders of flagellant groups were burned. Flagellants were found in some districts in Europe and South America into the 19th century, appearing at Lisbon in 1820, among American Indians during Catholic festivals, and in other isolated incidents.

Flagellata (*flāj-ē-lā'tā*), a class of one-celled organisms, some of them plants, some of them

animals, which are characterized by flagella. The flagella are whiplike filaments which propel the organisms by their lashing action. Flagellates are numerous, the various species differing in complexity of structure and in number of flagella. Plant forms include species of the genus *Euglena* which are almost indistinguishable from green algae. Among the other forms are parasites which live in human and animal bodies, e.g., the genus *Trypanosoma*, species of which cause the African sleeping sickness—carried by the tsetse fly, and the genus *Leishmania*, species of which cause some human fevers—carried by sandflies. Some flagellates live in fresh water, rendering it undrinkable; some live in topsoil, affecting its fertility; and others live in seawater, one of the most notable occurring in such numbers as to make regions of the ocean orange. The class is also called Mastigophora and belongs to the phylum Protozoa.

Flagg (*flāg*), JAMES MONTGOMERY, artist and writer, born in Pelham Manor, N.Y., June 18, 1877; died in New York, N.Y., May 27, 1960. He was trained at the Art Students' League of New York before going to England and France for further art study. Flagg began his magazine illustrations while still in school. Noted for his work for *St. Nicholas*, *Judge*, *Life*, and other magazines, he also exhibited portraits and water colors. He executed 45 posters for New York State, during World War I, which were particularly well known. Flagg also wrote and illustrated travel books and satirical works, wrote a series of motion pictures called "Girls You Know," and published an autobiography, "Roses and Buckshot" (1946).

Flagler (*flāg'lēr*), HENRY MORRISON, businessman and promoter, born in Hopewell, N.Y., Jan. 2, 1830; died in West Palm Beach, Fla., May 20, 1913. Flagler's early career as a businessman culminated in his association (1867 and after) with John D. Rockefeller in the firm which became the Standard Oil Co. He remained active in the management of Standard Oil until 1908. He was as well known, however, for his development of the Florida resort area. Following a trip to the Florida coast (1883), he began to build up the Florida East Coast Ry., which was completed to Key West in 1912 (abandoned in 1935 from the mainland to Key West). Flagler built and owned hotels in Florida and Nassau and ultimately spent some \$40,000,000 in Florida.

Flag Officer (*flāg ōf'i-sēr*), a term used to designate a naval officer of rank high enough to command a fleet or a subdivision of a fleet. Such an officer carries at the masthead a flag instead of a pennant and is the naval equivalent of the general officer in the military. The vessel of the flag officer is called the *flagship*.

Flag of Truce (*flāg of trōos*), a signal that

one of two contending naval or military forces desires to suspend hostilities. The flag used for such a purpose is white, and indicates that the party displaying it wishes to communicate or surrender. Firing upon a flag of truce is a breach of the naval or military code, and such an offense subjects the guilty party to severe retaliation and punishment. A flag of truce is sent by the senior officer to one of like rank, but the party who is to receive it may refuse acceptance, and the party bearing it may be warned not to proceed farther by a shot fired across the bow. A failure to stop when thus warned renders the party liable to be fired upon. A flag of truce is not permitted to be used to obtain private information, but serves only as a signal that the party displaying it desires to communicate.

Flag Signals (*fläg sîg'nalz*), international code of signals for use at sea; flag signals are also sometimes used on land for sending messages short distances. See also *Semaphore*; *Signals*.

Flagstad (*fläg'städ*), KIRSTEN, opera singer, born in Hamar, Norway, July 12, 1895; died in Oslo, Dec. 7, 1962. She studied in Oslo with her mother, an operatic coach, and with other teachers. She made her debut at the National Theater in Oslo. This was followed by several years of oratorio, operetta, and musical comedy appearances. In 1927 her opera career was launched at Göteborg and Oslo. In 1933-34 she appeared at the famed Bayreuth (Germany) Festivals. In 1935 she was introduced to an American audience as *Sieglinde* in Wagner's "*Die Walküre*" at the Metropolitan Opera House, New York City, where she continued to excel in Wagnerian roles. Opera and concert tours of the U.S., Europe, and Australia followed. She returned to Norway during World War II. She resumed her career in 1947 and in 1952 retired from the Metropolitan Opera in triumph. She gave her last concert in Oslo in 1953.

Flagstaff (*fläg'stäf*), a city in northern Arizona, seat of Coconino County. Located at an altitude of ca. 6,900 ft., it is noted as a health resort. It has lumber mills and is the seat of Arizona State Coll. and Lowell Observatory. There are Indian ruins in the vicinity. Population, 1960, 18,214.

Flagstone (*fläg'stôn*), or FLAG, the name of any rock that splits into tubular masses or flags, suitable for curbing, sidewalks, or doorsteps. Flagstones may be obtained from a variety of rocks, such as sandstone, limestone, and brownstone. A class of sandstone of the Devonian age yields bluestone which is suitable for paving.

Flamboyant (*fläm-boi'ant*), in architecture, a showy style of decoration used extensively in the 15th century. It originated in France and is a form of Gothic architecture. Its realistic and pictorial treatment of decorative sculpture corre-

sponds to the perpendicular style used in England about the same time. The windows and panels are distinguished by flamelike tracery. The masterpieces of this style include the choir of St. Séverin in Paris and the façades of the cathedral in Rouen.

Flame (*fläm*), a blaze, or a state of visible combustion in which an incandescent gas mixture is produced. A flame is usually divided into several parts which vary in the amount of gas contained, in illuminating power, and in color.

Flame-Arc-Light (*fläm-ärk-lit*), a high-intensity source of light employing the electrical discharge in the vapor between electrodes of metal or carbon. The major portion of the light from the carbon arc originates in a crater formed in the positive electrode. The flaming arc utilizes carbon electrodes which have a core of magnesium or calcium salts. The light from the flaming arc is a brilliant golden color. The metal arc uses a copper rod for the negative electrode and an iron tube filled with powdered magnetite for the positive electrode.

Flame, TEMPERATURE OF. A flame is the zone of reaction between gases at the temperature required for combustion. Combustible solids and liquids burn with a flame, because the heat melts the solid, vaporizes the resulting liquid, and the union of this vapor with the oxygen of the air gives the flame. When but one gas, such as carbon monoxide, burns in oxygen, the flame is structurally simple, consisting of an inner and outer cone. The inner cone contains unburned gas surrounded by the outer cone of visible flame where the gas and oxygen are uniting. Where flames are produced by mixed gases, such as those from coal, natural gas, candles, petroleum, etc., the inner cone of unburned gases (200-300° C.) is surrounded by a cone where these gases are decomposed by heat, and particles of incandescent carbon are released, adding to the luminosity of the flame. An outer envelope of almost invisible flame surrounds the inner two cones. In this sheath hydrogen and carbon are completely oxidized to water and carbon dioxide. This outer sheath of flame is very hot, some 1550° C., and has abundant oxygen. It will rapidly oxidize suitable materials, and for this reason it is called the oxidizing flame. The middle cone of the flame lacks sufficient oxygen for combustion, and so it will remove oxygen from materials able to supply it. Thus it will take oxygen from the oxides of heavy metals and reduce them to metals. This middle zone of the flame is called the reducing flame.

Flame Temperatures

Alcohol and air	1705° C.
Gas (Bunsen burner—no air)	1712° C.
Gas (" " —full air)	1871° C.
Gas (" " —full air)	1900° C.
Hydrogen and air	2100° C.
Gas and oxygen	2200° C.

Hydrogen and oxygen (Oxyhydrogen torch)	2420° C.
Acetylene and oxygen (Oxyacetylene welding torch)	3000° C.
Thermite	3000° C.

The atomic hydrogen flame, produced when hydrogen is passed through an electric arc between tungsten electrodes, consists of a flame of molecular hydrogen burning in air, within which is an inner zone of atomic hydrogen changing to molecular hydrogen. Tungsten, with the exceptionally high melting point of 3370° C., melts instantly in the heat of this flame, which is probably around 6000° C.

Flamethrower (*flām-thrō'ēr*). See *Chemical Warfare*.

Flamingo (*flā-mīng'gō*), a genus of migratory birds which until recently were placed among the waders, but they are now generally classed among the swimmers. However, they seldom use their webbed feet for swimming, the web formation being designed rather for support on the soft, muddy bottoms. The body is not large, but the long neck and legs permit them to stand from



Courtesy N. Y. Zoological Society

EUROPEAN FLAMINGO

3½ to 4 ft. high. In many respects the bill resembles that of a duck, but it turns suddenly downward near the middle, the mandible being furnished with small toothlike edges, which serve to prevent the escape of crustaceans, mollusks, worms, fish, or seeds, the common food. Flamingoes are birds of powerful wings and fly either in single file or in wedge-shaped flocks like geese, a single bird leading the way for the flock. The prevailing color is pinkish or reddish. The nest is made of mud scraped into a mound with the feet and hollowed out on top, in which two or three white eggs are laid and hatched, the young reaching maturity in about a year. Flamingoes inhabit Eurasia, Africa, and America. When feeding, they keep their feet continually going to stir up the mud. Some of the older birds act as sentinels for security to the rest.

Flaminian Way (*flā-mīn'i-an*), the chief road leading from ancient Rome to the northern provinces, so named from Caius Flaminius the Elder. It was platted to Arminium by Flaminius in 220 B.C., at the time he was censor, and subsequently branches were laid out to all the important towns in the northern part of Italy. The length of the main road was 222 m., which distance included many large grades and substantial bridges, remains of which are still found at some places.

Flammarion (*flā-mā-rē-ōn'*), CAMILLE, astronomer, born in Montigny-le-Roi, France, Feb. 15, 1842; died June 4, 1925. In 1858 he entered the Paris observatory, and soon became distinguished as a lecturer on astronomy. He was selected as editor of *Cosmos* in 1862. After 1865 he devoted his time largely to the publication of books and as scientific editor of *Siccle*. For the purpose of studying aerial phenomena, he made numerous balloon ascensions, and in 1892 published an elaborate treatise on the theory that communication between the earth and planets which are nearest us is not impossible. Among his works are: "Studies and Lectures on Astronomy," "Marvels of the Heavens," "Stars and Curiosities of the Heavens," "God in Nature," "Plurality of the Inhabited Worlds," and "Imaginary and Real Worlds."

Flanagan (*flān'a-gān*), EDWARD JOSEPH, Jesuit priest, director of Boys Town, Neb., born in Roscommon, Ireland, July 13, 1886. He came to the U.S. in 1904, receiving his education at Mt. St. Mary's, Emmetsburg, Md.; St. Joseph's Seminary, Dunwoodie, N.Y.; Gregorian Univ., Rome, Italy, and the Jesuit Univ. at Innsbruck, Austria. In 1912, he was ordained a priest and in the same year became assistant pastor of St. Patrick's parish in O'Neill, Neb. He established the Workingman's Hotel in Omaha (1914), and opened a Home for Homeless Boys in Omaha (1917), later moving to larger quarters, about 10 m. outside of Omaha, which became an incorporated village known as Boys Town. Two motion pictures were made about Father Flanagan and Boys Town, one in 1938 and the other in 1941. He died on May 15, 1948, while on an inspection tour of Germany.

Flanagan, JOHN, sculptor, born at Newark, N.J., in 1865. Noted especially for his bronze reliefs and fine medal work, he studied under St. Gaudens in New York, and at the Ecole des Beaux Arts, Paris. He executed the famous Library of Congress clock in Washington, D.C., busts of Samuel P. Langley (Smithsonian Institution, Washington, D.C.), and of Joseph Henry (Hall of Fame, New York City), etc. He executed the famous "Medaille de Verdun" in memory of the World War I battle of Verdun. He died in 1952.

Flanders (*flān'dērz*), the former name of a region of Europe, extending along the North Sea. It is now included in Belgium, Holland, and



Photo by B. Holmes, courtesy Ewing Galloway, N. Y.

FLANDERS. VIEW OF BRUGES

France, forming the provinces of East and West Flanders, in Belgium; the southern part of Zeeland, in Holland; and all of Le Nord, in France. The original inhabitants were Belgic tribes, who were subdued by Caesar, and the region was added to Roman Gaul. Later it came into the possession of the Franks and was added to Neustria by the Treaty of Verdun. Philip the Bold made the territory a government district in the 9th century and placed it under the rule of his son-in-law, Count Baldwin I. In 1016 the town of Valenciennes was added and Ghent and the Zeeland Islands became a part of the district at about the same time. Hainaut, Alost, and Tournai were added in the reign of Baldwin V, after whose death the region was divided and passed consecutively to various countries.

In the 12th century the manufactures and commerce of Flanders rose to vast importance, and in the former part of the 14th century the Flemings were able to compete successfully with France. The latter country relinquished its claims to Flanders in 1526. Later it passed to the united houses of Austria and Spain, though Charles V of Germany ultimately secured control of the larger portion. A part was united with the Netherlands by the Treaty of Westphalia, and other portions to France by the Treaty of the Pyrenees in 1659, the Treaty of Nymegen in 1678, and the Treaty of Utrecht in 1713. The other portions then remaining independent now form the provinces of East and West Flanders in Belgium.

East Flanders has an area of 1,147 sq. m. and,

in 1941, had a population of 1,200,121. The area of West Flanders is 1,249 sq. m. and the population, in 1941, was 971,472. Ghent is the capital of the former and Bruges of the latter. The soil is productive and carefully cultivated, while the manufactures of the various products, such as laces, linens, and damasks, excel in quality. Both provinces have extensive communication by canals, electric railways, and steam railroads.

Flandrin (*flän-drän'*), JEAN HIPPOLYTE, painter, born in Lyons, France, May 23, 1809; died in Rome, Mar. 21, 1864. He ranks as the most renowned French historical and religious painter of the last century, and decorated numerous churches in France in 1842-45. Among his most noted productions are: "St. Clair of Nantes," "Christ Going Up to Calvary," and "Christ Entering Jerusalem." The last mentioned is at the Parisian Church of St. Germain-des-Prés.

Flannagan (*flän'a-gan*), JOHN BERNARD, sculptor, born in Fargo, N.D., Apr. 7, 1895; died Jan. 7, 1942. He studied painting at the Minneapolis Institute of Art, but was self-taught in sculpturing. He began a long series of one-man shows in 1927, and five years later received a Guggenheim traveling fellowship. Disdainful of the obviously monumental, his work is distinguished by abstraction and simplification of form, and many of his works are carved from rough fieldstone. His sculptures have been shown in the Metropolitan Museum of Art and the Museum of Modern Art, as well as in other museums around the world, and he is represented in the permanent collections

of such well-known galleries as the Dublin Art Gallery and the Whitney Museum of American Art. Some of his better-known works are "Figure of Dignity" (an Irish mountain goat in the permanent collection of the Museum of Modern Art), "Mother and Child," "Elephant," and a three-foot bronze, "Jonah and the Whale."

Flannel (*flān'el*), a woolen fabric differing from broadcloth and cashmere in being woven of yarn which is twisted more loosely. It varies in degree of fineness, and is used extensively for shirts and undergarments. By allowing the perspiration easy passage and not seeming cold to the body when damp, it is cooler in summer and warmer in winter than other fabrics. A class of loosely woven fabrics made of cotton are known as *outing flannels*. They have a napped face and many of the designs are in attractive colors. Another class, the *domest flannels*, are made with cotton warp and woolen filling.

Flare (*flār*), a pyrotechnic compound which will burn and emit light for a period after placing and ignition. A flare may be placed by propulsion in the air, dropped from planes to illuminate desired areas, or set on the ground as a warning signal, as on railways and highways. Flares are usually composed of potassium chlorate or nitrate in combination with various slow-burning materials. Color-producing substances are often added, such as sodium for yellow light, strontium for red, barium for green, and copper for blue.

Flash Point (*flāsh point*), the temperature at which lubricating oil or petroleum distillate will ignite momentarily after the application of a flame. When the oil is heated in an open pan the application of the flame has no effect until the flash-point is reached, after which a flame spreads over the surface of the oil. The effect depends upon the accumulation of sufficient vapor above the surface to support momentary combustion. The flash-point is lower than the burning-point and ignition-point.

Flatfish (*flāt'fish*), the common name of all fishes that swim on their side, such as the sole, flounder, turbot, plaice, and halibut. The body is much compressed. The side which is turned toward the bottom is generally colorless. It is called the blind side, from the absence of an eye, since both eyes are on the upper side of the head. Some flatfishes have the right and others the left side turned toward the bottom.

Flat Foot (*flāt fōt*), in medicine, a flattening of the sole of the foot, resulting in a sunken arch. Excessively heavy weight, anatomical abnormalities, general constitutional weakness, and certain occupations which require continuous standing, are the principal causes of flat feet.

Flathead (*flāt'hēd*), the name applied to various Indian tribes, owing to their custom of flattening the skulls of infants by pressure. This

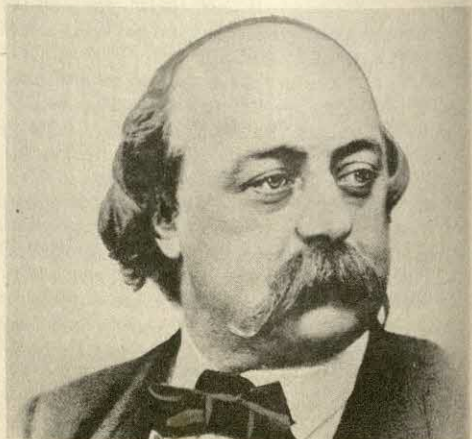
practice was common to the fish-eating Chinook Indians on the Pacific coast; to the ancient natives of Peru, both previous and subsequent to occupation by the Incas; among the Caribs of Florida and Central America; and, it is thought, among the mound builders of the Mississippi Valley. The civilized Selish Indians are improperly called Flatheads, as they do not flatten the skulls of their children. They originally inhabited the valley of the St. Mary's River, but conveyed their lands to the U.S., and were removed to Idaho in 1871, where they occupied the Jocko reservation. They always were peaceable and are now advanced in education and the industries.

Flattery (*flāt'tēr-y*), CAPE, a high promontory at the northwest extremity of Lewis County, Washington, between the Pacific Ocean and the Strait of Juan de Fuca. It is the westernmost point of the U.S. (excluding Alaska).

Flaubert (*flō-bār'*), GUSTAVE, author, born in Rouen, France, Dec. 12, 1821; died in Croisset, May 7, 1880. The son of a prosperous physician, he studied both medicine and law at Paris, but abandoned these interests for writing. He became one of the two greatest French writers of the 19th century; the other was Balzac (*q.v.*). While Balzac had little influence on succeeding generations, French literature, by the end of the 19th century, had been considerably affected by Flaubert, and his influence was also apparent in English literature.

His first novel, "Madame Bovary" (1857), established the principle of a merciless naturalism which was to set a standard for French fiction from then on. This naturalism was in sharp contrast to the then leading school of Romanticism, whose foremost French exponent was Victor Hugo (*q.v.*). In "Madame Bovary" Flaubert described the life of a French provincial town, showing how such a narrow environment

GUSTAVE FLAUBERT





Photos by Osborne, courtesy U.S. Dep't. of Agric.

BINDING FLAX INTO BUNDLES

When dry, flax straw is run into a machine that binds it into bundles for convenient handling. The straw must be kept parallel so that it can be spread uniformly for future handling

creates and influences the emotional lives of the inhabitants. This novel, like all his others, reveals Flaubert's exquisite craftsmanship: he worked for hours and days over single sentences, even single words. This laboriously achieved mastery of the written word made him France's supreme literary craftsman, and the ideal of many writers in other Western nations.

Besides this stylistic precision Flaubert had a talent for minute observation and for cool, objective description like that of a well-trained natural scientist. A trip to Tunisia inspired his novel "Salammbô" (1862), a historical novel of the time of Hannibal. The combination of exact archaeological studies with a grandiose artistic vision resulted in a masterpiece far surpassing the ordinary historical novel of Flaubert's times or later. From that time on his works—including "Sentimental Education" (1874), "The Temptation of St. Anthony" (1874), "The Legend of St. Julian the Hospitaller," "Herodias," "A Simple Soul" (all published in 1877), and "Bouvard and Pécuchet" (posthumously published, 1881)—became elaborate psychological studies, enhanced by subtly described historical details. The fact that Flaubert (who, however, did not have to earn a living by his writing) produced so few works is generally taken to indicate his sense of the artist's responsibility to produce, in so far as possible, nothing but masterpieces.

Flax (*flæs*), an annual plant with alternate linear-lanceolate leaves, many-flowered broad cymes, usually yellow, blue, or white, and crenulate petals. It embraces about 100 species, which grow more or less widely distributed in all warm and temperate climates. A large yield comes from the U.S. More than one-half of the U.S. crop is grown in North Dakota. The states which rank next are Minnesota and South Dakota. Other



SCUTCHING FLAX

The "scutcher" machine turns retted flax straw into flax fiber. After combing the fiber with a "hackle," the operator separates the fibers so that they can be graded and made ready for spinning

regions which produce large quantities of flax are Manitoba, Saskatchewan, Argentina, the U.S.S.R., India, and Austria. However, Argentina generally takes the first rank in the production of flaxseed, while the U.S.S.R. is the leading flax-fiber producing country in the world. Flax is grown extensively on account of the commercial value of the seed as well as for its fiber. In most countries the virgin soil, when first broken, produces the best yield of flax. The ground is plowed in autumn or in the spring, depending upon the locality, and the seed is either sown in drills or broadcast, usually in April. When the crop is ripe, generally in August, it is cut with a harvester and is afterward threshed with a machine to obtain the seed.

A large amount of labor is required to obtain the fibers in the best condition. For this purpose the crop is usually pulled up by hand, roots and all, and the seeds are removed by a process called *ripping*. To obtain the *lint*, or flaxen fiber, from the *boon*, or core, of the stem, the bundles are steeped in water until the boon begins to rot, when it can be separated readily from the fiber by means of a *scutching blade* or a machine. It is next *hackled*, or combed, after which it is spun into threads and woven into cloth. Linseed oil is pressed from the seed, and the residue is a highly fattening food for hogs and cattle. Flax was cultivated extensively in ancient times, both in Egypt and Asia, and linen is spoken of in the Book of Joshua. See *Linen*; *Linseed Oil*.

Flavian Caesars (*flā'vī-an sē'zēra*), a group of Roman emperors comprising Vespasian (9-79 A.D.), and his sons, Titus (ca. 40-81) and Domitian (81-96).

Flaxman (*fläks'man*), JOHN, sculptor, born in York, England, July 6, 1755; died Dec. 7, 1826. He entered the Royal Acad. as a student in 1770, where he later made models and designs for the potter, Josiah Wedgwood (1730-95), and in the same year won a silver medal. He went to Rome in 1787, where he studied seven years and pro-

duced numerous designs to illustrate the works of Dante, Homer, and Aeschylus. In 1794 he returned to London. Among his numerous works are monuments to Lord Nelson, Sir Joshua Reynolds, and others, in Westminster Abbey. The Royal Acad. appointed him a professor of sculpture in 1810.

Flea (flē), a minute, wingless insect of the order Siphonaptera, so named from its tubelike mouth parts and its winglessness. The body of the flea is laterally compressed, and the legs are adapted for jumping. The life stages of fleas (between three to 10 weeks, depending on temperature) resemble those of flies, with eggs, maggots which live in dirt and litter on floors, a quiescent pupa stage, and finally the adult stage. About 900 species have been described, all living on the blood of mammals or birds. The human flea, *Pulex irritans*, the common flea of worldwide distribution, also attacks domestic animals, pets, rats, and birds; it is rare in North America but plentiful throughout the Eastern Hemisphere. The most common household fleas in the U.S. are the dog flea (*Ctenophthalmus canis*) and the cat flea (*Ctenophthalmus felix*), which also attack human beings. Certain fleas have been recognized as transmitters of the various forms of plague.

Fleabane (flē'bān), the name of several species of plants of the aster family, widely distributed on all the continents, and once regarded as useful in driving away fleas. The common fleabane of England grows to a height of 15 in. and has panicked flowers. Horseweed, sweet scabious, and butterweed are names given to species found in the Mississippi Valley of the U.S., especially the northeastern section.

Flecker (flēk'ēr) (HERMAN) JAMES ELROY, poet, born at Lewisham, London, England, Nov. 5, 1884; died at Davos, Switzerland, Jan. 3, 1915. Educated at Oxford and Cambridge, he served three years with Britain's consular service before tuberculosis struck him. He published much poetry, including "The Golden Journey to Samarkand" (1913). His "Collected Poems" (1916) and two plays, "Hassan" (1922) and "Don Juan" (1925), were posthumously published.

Fleet Prison (flēt prīz'n), a famous London jail which stood on Farringdon Street at Fleet Market, deriving its name from the stream that met the Thames River there. The king's prison from the 12th century, it held religious martyrs in the reigns of Mary and Elizabeth, political prisoners under Charles I, and Puritans after 1660. As an 18th-century debtors' prison, it was known for cruel practices and for the Fleet marriages, clandestine marriages performed by clergymen imprisoned for debt. The prison was abandoned in 1842 and later (1845-46) demolished.

Fleet Street (flēt strēt), a London thoroughfare, famous today as the site of many newspaper

offices. Earlier, many famous men, including Izaak Walton and Dr. Samuel Johnson, lived in the neighborhood, and the street had noted coffee houses and taverns. Running from Ludgate Hill to Temple Bar, it takes its name from the Fleet River, now a sewer.

Fleming (flēm'ing), SIR ALEXANDER, bacteri-



SIR ALEXANDER FLEMING

ologist, born in Lochfield, Darvel, Scotland, Aug. 6, 1881; died in London, England, March 11, 1955. He was trained at St. Mary's Hospital Medical School, Univ. of London, later remaining at the Univ. of London as a professor of bacteriology, teaching and doing research until World War I. During the war he served as a captain in the Royal Army Medical Corps, afterward returning to teaching and research at St. Mary's medical school. Famous for his discovery of the "wonder drug," penicillin (*q.v.*), he first noticed the drug in 1928, while doing research on influenza. For a year, he tried unsuccessfully to purify it, then announced his discovery, hoping someone would join him in the research. Progress on the drug halted until 1939, when Dr. H. W. Florey and Dr. Ernst B. Chain (*qq.v.*), of Germany, attacked the problem. They were able to purify the drug, and a report was issued to the medical profession a year later. By 1943, penicillin was revealed to the world as a germ killer which would save millions of lives. In 1945 the three men won the Nobel Prize for their discovery. Fleming became known also for his discovery of another antiseptic substance, lysozyme. He was knighted in 1944.

Fleming, ARTHUR HENRY, philanthropist and lumberman, born in Ontario, Canada, April 3, 1856; died Aug. 11, 1940. He became president or principal owner of many important Western lumbering and mining firms. He also served as president of and helped found the Cali-

fornia Inst. of Technology in Pasadena. He was given the medal of the French Legion of Honor and received international recognition for a 100,000-franc gift to the French government to establish a pavilion and park in Compiègne forest as a shrine for the railway car in which the Armistice of World War I was signed.

Fleming, SIR JOHN AMBROSE, electrical engineer, born in Lancaster, England, Nov. 29, 1849; died in London, April 18(?), 1945. A graduate of University Coll., London, he was a lecturer at Cambridge Univ. and later a professor of electrical engineering at University Coll. (1885-1926). He received many awards for his investigations in the field of electricity.

He invented the first thermionic valve (electron tube) and contributed greatly to the development of the telephone, electric lighting, and wireless telegraphy. His many publications include "The Principles of Electric Wave Telegraphy and Telephony" (1906) and "Fifty Years of Electricity" (1921).

Fleming, SIR SANDFORD, engineer, born at Kirkcaldy, Scotland, Jan. 7, 1827; died July 22, 1915. He came to Canada in 1845 and became chief engineer on the Northern Ry. in 1857. As chief government engineer (1867-80), he supervised the building of the Intercolonial and the Canadian Pacific Rys. He made recommendations for the unification of time and for the division of the world into time zones. In 1880 he was made chancellor of Queen's Univ. His publications include "A Cable Across the Pacific," "Uniform Standard Time," and "The Prime Meridian Question."

Flemish (*flem'ish*), the language spoken in a number of Belgian provinces, portions of Holland and France, and several countries adjacent to these. It is a form of Low German, or *Platt-Deutsch*, and differs but slightly from the German in pronunciation and orthography. In East and West Flanders, Limburg, Antwerp, and Brabant it is the universal tongue and gives evidence of but little change in dialect since the 8th century. The language spoken is similar to the form of speech used by the Council of Liptines in 742, while preparing a creed by which pagans renounced idolatry when they embraced the Christian faith.

The Flemish literature is comparatively modern, and before the 19th century it was identical with the Dutch. However, some of the early writers of the literature which belongs to The Netherlands may be said to have laid a distinct foundation for the Flemish of modern times. Jacob van Maerlant (*fl. ca. 1260*) is considered the father of Flemish poetry. He wrote a long poem on the story of Troy, and a world history called "The Mirror of History." "Reynard the Fox" was written shortly afterward. In 1618 a

translation of the Bible was made into the Flemish. It contains such elegance of expression that it is regarded as the standard authority in orthography and construction. French ascendancy tended to limit the language and literature, but after 1830 Flemish began to revive and take on its present form. Among the noted leaders in the revival of Flemish were Jan Frans Willems, Philipp Blommaert, F.A. Snellaert, Prudens van Duyse, Hendrik Conscience, Jan Theodoor van Rijswijk, and Jan Renier Snieders. Noteworthy modern Flemish authors include Herman Teirlinck, Gerard Walschap, and Willem Elsschot.

Flemming (*flem'ming*), ARTHUR S., university president, government official, born in Kingston, N.Y., June 6, 1905. He was educated at Ohio Wesleyan Univ. and American Univ., Washington, D.C., where he was an instructor in government from 1927 to 1930. From 1930 to 1934 he was on the editorial staff of the *U.S. Daily* (now *U.S. News and World Report*) and then served (1934-39) as director of the School of Public Affairs at American Univ. He was a member of the Civil Service Commission (1939-48), and during World War II he held many executive and advisory positions, including posts with the Office of Production Management, the Navy Dept., the War Manpower Commission, and the Atomic Energy Commission. From 1953 to 1957 he was director of defense mobilization. He was Secretary of Health, Education, and Welfare in 1958-61. President of Ohio Wesleyan Univ. in 1948-53 and 1957-58, he became president of the Univ. of Oregon in 1961.

Flensburg (*fless'n'börg*), a city in northern Germany, in Schleswig-Holstein, about 40 m. n.w. of Kiel. It is located on the Flensburg Fjord of the Baltic Sea and has railroad and electric railway facilities. The chief buildings include a courthouse, a theater, a public library, and the Marienkirche. Among the manufactures are carpets, oil, machinery, clothing, and sailing vessels. It has a large trade in coffee, grain, and livestock. Flensburg was founded in the 12th century; it was occupied by the British at the end of World War II. Population, 1946, 100,315.

Fletcher (*flech'er*), JOHN GOULD, poet and author, born at Little Rock, Ark., Jan. 3, 1886; died there, May 10, 1950. He attended Harvard Univ., but left before graduating and went to Europe where he remained until 1914. Winner of the Pulitzer Prize for Poetry (1939), he is counted among the imagists in modern poetry. His books of poems include "Fire and Wine" (1913), "Japanese Prints" (1918), "Branches of Adam" (1926), "XXIV Elegies" (1935), "The Epic of Arkansas" (1936), "Selected Poems" (1938), and "South Star" (1941). He is also the author of several critical works, notably "Paul Gauguin: His Life and Art" (1921). In 1937 he

wrote his autobiography, "Life is My Song."

Flettner (*flēt'nēr*), ANTON, engineer, born near Frankfort-on-the-Main, Germany, in 1885; died in New York, N.Y., Dec. 29, 1961. He was a teacher of physics but became best known as the inventor of the rotor ship and of radio-operated, remote-controlled war equipment. He came to the U.S. after World War II and, as president of Flettner Aircraft Corp., designed helicopters for the Defense Dept.

Fleur-de-Lis (*flēr-dē-lē'*). See *Iris*.

Fleury (*flē-rē'*), ANDRÉ HERCULE DE, cardinal, born at Lodève, France, June 22, 1653; died Jan. 29, 1743. He studied at Paris, entered the church, and in 1698 was made Bishop of Fréjus. In 1715 he became tutor to the young Louis XV, who was then five years of age, and when the latter ascended the throne Fleury was made a member of the council of state. He was raised to the dignity of cardinal in 1726, when he virtually became prime minister. He favored peace, reduced government expenses, and promoted a policy of internal improvement. The Bibliothèque Nationale at Paris was completed during his administration.

Fleury, CLAUDE, clergyman and historian, born in Paris, Dec. 6, 1640; died there July 14, 1723. He was educated at the college of Clermont. Serving first as a jurist, he later became a priest, an educator of the princes of the French court, and father confessor of the young King Louis XV. His main work is "Histoire ecclésiastique," 20 volumes, which appeared first in 1691.

Flexner (*flēks'nēr*), ABRAHAM, educator, born in Louisville, Ky., Nov. 13, 1866; died in Falls Church, Va., Sept. 21, 1959. He was educated at Johns Hopkins, Harvard, and Berlin universities. Flexner began to teach in Louisville in 1886. While on the staff of the Carnegie Foun-

dation for the Advancement of Teaching (1908-12), he conducted an investigation of medical education. Largely because of this study, nearly one-half of the medical schools in the U.S. were closed, and medical training was generally reshaped. Flexner was associated with the General Education Board (1913-28) before he helped to establish the Inst. for Advanced Study at Princeton, N.J., of which he was director (1930-39) and director emeritus (1940 *et seq.*). Among his books were "The American College" (1908), "Medical Education in the United States and Canada" (1910), "Universities—American, English, German" (1930), and an autobiography.

Flexner, SIMON, pathologist, brother of Abraham Flexner; born in Louisville, Ky., 1863; died in New York City, May 2, 1946. Educated at the Univ. of Louisville and other institutions, he was professor of pathology at Johns Hopkins Univ. (1895-99), and at the Univ. of Pennsylvania (1899-1903). From 1903 to 1935 he was director of laboratories of the Rockefeller Inst. for Medical Research in New York. His many papers in the field of bacteriology and pathology include studies on such subjects as snake venom, dysentery, a serum for cerebrospinal meningitis (1905), and the germ of infantile paralysis.

Flicker (*flīk'ēr*), the popular name for the golden-winged woodpecker, a beautiful bird common to the eastern part of Canada and the U.S. It is about one ft. in length, has an olive-brown color, with black and white markings, and the head and neck are ash-colored. It winters in the southern part of the U.S., moving northward on the early approach of spring. Its food consists chiefly of worms and insects, which it finds on trees, but it also feeds on berries and the tender parts of plants. A large number of species of the flicker have been listed, approximately 35. The *red-shafted flicker* is common to the region west of the Rocky Mts., from Mexico to Alaska. *Yellowhammer*, *sapsucker*, and *high-holder* are other names locally applied to birds of this class.

Flint (*flint*), a mineral regarded as a species of quartz, or as intermediate between quartz and opal, consisting almost entirely of silica. It has slight traces of oxide of iron, lime, and carbon, and contains some organic matter. Flint is usually gray, smoke-brown, or brownish-black, but is sometimes spotted or mottled. Dark-colored varieties in the form of nodules, or small irregular lumps, are usually found imbedded in chalk and are abundant wherever chalk formations prevail. Flint, when struck with steel, produces a spark of fire, which property was formerly made use of in firearms and for starting fires. See *Flint Implements*.

Flint, a river of Georgia which rises in Clayton County and flows by an irregular course to the



ABRAHAM FLEXNER



AIR VIEW OF FLINT, MICH.

southwestern corner of the state, where it joins the Chattahoochee to form the Apalachicola River. It flows for 330 m. through a rich agricultural and mining country. The Flint is navigable as far as Bainbridge, a distance of 28 m. from its mouth.

Flint, a city in central Michigan, seat of Genesee County, on the Flint River, 50 m. n.w. of Detroit. It is served by the Chesapeake & Ohio and the Grand Trunk R.R.'s. Bishop Airport is 3 m. s.w. of the city. Flint covers an area of 29.9 sq. m., of which 2,000 acres are devoted to ca. 55 parks. It is the site of the General Motors Inst. of Technology, the Michigan School for the Deaf, and the Flint Inst. of Arts.

Flint's chief manufactures are automobiles and accessories; other products include machinery, house trailers, and chemicals. The surrounding area produces fruits, wheat, corn, oats, and truck crops. The city is the center of the Flint standard metropolitan statistical area (1960 pop., 374,313), which includes all of Genesee County. In 1958 the area had a value added by manufacture of \$578,648,000.

The site of Flint was settled in 1819 as a fur-trading post on the site of an Indian village. It was laid out in 1835 and incorporated as a city in 1855. In 1900 the population was 13,103. The city's decade of greatest growth was from 1920 to 1930, which saw an increase from 91,599 to 156,492. In 1950 the population was 163,143; in 1960, 196,940.

Flint, AUSTIN, physician, born in Petersham, Mass., Oct. 20, 1812; died in New York City, March 13, 1886. A graduate (1833) of Harvard,

he practiced in Northampton, Boston, and Buffalo. In 1847 he founded Buffalo Medical Coll., and he was a professor there until 1861. In that year he founded Bellevue Hospital Medical Coll. in New York City; he taught there until his death.

His son AUSTIN FLINT, physician, was born in Northampton, Mass., March 28, 1836; died in New York City, Sept. 23, 1915. A graduate (1857) of Jefferson Medical Coll. in Philadelphia, he was professor of physiology at the Univ. of Buffalo (1857-60), New Orleans Medical Coll. (1860-61), Bellevue Hospital Medical Coll. (1861-98), and Cornell Univ. (1898-1906).

Flint Implements (*im'plē-ments*), artifacts used and usually fashioned by man, made of flint (*q.v.*). The great majority of the earliest stone tools and weapons left by man, especially in western Europe, were made of flint by percussion and pressure flaking. The earliest implements consist of great numbers of bi-convex core forms, essentially hand axes, called *coups de poings*. Later smaller artifacts were made from the flakes of flint, rather than from the nodules or cores (the form in which flint usually occurs imbedded in chalk). These include side and end scrapers, projectile points, knives, daggers, borers, burins, and gravettes. See also *Pre-History*.

Flintlock Gun (*flint'lōk gūn*), a small gun originated by the Spaniards in the 17th century. It has a small piece of flint in the jaw of the hammer, which, when released, strikes a piece of steel, and the sparks ignite and explode the charge. William III introduced flintlock muskets into England, where various forms of these fire-

arms continued in use until about 1840. See also *Gun*.

Floating Islands (*fłot'ing i'landz*), the formations caused in lakes and other inland waters by the aggregation of driftwood carried down by rivers, and by deposits of soil and vegetable matter, or by detachments of elevations adjacent to the banks of rivers or on shores of lakes. These islands occur more numerous in tropical countries. They acquire their early foundations from interlacing roots of plants, and later from the growth of shrubs and even trees. Some of the islands are large enough to furnish pasturage. They are found from 50 to 100 m. from the mouths of the large rivers of Asia, Africa, and America.

Flocculation (*fłok-ù-là'shùn*), the process of agglomerating fine particles into larger groups of such size that they can be settled or filtered out of liquids or gases. In water purification, lime, chlorine, or ferric chloride will cause a coagulation or flocculation. In farming, soils are often treated to change the texture by the addition of lime or potash to permit better root penetration. In the sterilization of air, the hygroscopic glycols may be sprayed into the air under controlled conditions to agglomerate particles, bacteria, and viruses. Flocculation is also used in ore processing, and in many industrial fields.

Flodden (*fłod'den*), **BATTLE OF**, a military contest that occurred on Flodden Hill, Scotland, Sept. 9, 1513, between the English army commanded by the Earl of Surrey and the forces of James IV of Scotland, in which the latter were defeated. The English army consisted of 32,000 men and the Scottish of 30,000. Both sides lost heavily. The English army lost 4,000, while the loss of the Scots was much heavier and included several earls and other officers of high rank. A description of the battle is given in Sir Walter Scott's "Marmion."

Flood (*fłod*), a great flow of water, inundation; figuratively, an abundant supply or outpouring of anything. Many large areas of low ground

near rivers or oceans are subject to inundation from various causes, the most common being river floods resulting from unusual rains or thawing snows. Two of the best-known instances of such river flooding are offered by the Nile and the Mississippi. See also *Dam*; *Dikes*; *Reclamation*.

Flood Plain (*fłod plān*), a level tract of land on the border of a river, formed by sand and silt deposited during overflows. In many places the surface is highest near the margin of the river bank, where the greater amount of silt is deposited during an overflow, and some distance back are marshes and swamps, which are sometimes fed by springs or remain wet for want of sufficient drainage. The flood plains in the lower course of the Mississippi are very fertile. Formerly they were covered by meadows or swampy forests, but now they yield large quantities of agricultural products. Other tracts of this kind are located on the middle course of the Rhine and Danube and on the lower course of the Nile, Po, and Ganges. See *Delta*.

Flora (*fłor'ra*), Roman goddess of flowers. Her festival, the Floralia, was celebrated from Apr. 28 to the 1st of May. She typified the season of spring, and was the reputed guardian and protectress of every blossom.

Florence (*fłor'ens*), county seat of Lauderdale County, Alabama, on the Tennessee River, 119 m. s.w. of Nashville, Tenn. It is on the Southern and the Louisville & Nashville R.R.'s, in the heart of the Tennessee Valley Authority's development, and is surrounded by a fertile agricultural and fruit-growing country. The State Teachers College is located here. Wildwood and Kiwanis Parks are fine public resorts. Manufacturing is diversified. Coal deposits abound in the vicinity. Florence was settled in 1818 and incorporated in 1826. Population, 1950, 23,879.

Florence, county seat of Florence County, South Carolina, 82 m. n.e. of Columbia, on the Atlantic Coast Line and other railroads. An important retail and wholesale distribution center, it has railroad shops, mills, bakeries, foundries, and machine shops. It was chartered in 1871 and incorporated in 1890. Population, 1950, 22,513.

Florence (Italian, FIRENZE), an Italian city, capital of the province of the same name, on the Arno River, about 140 m. n.w. of Rome. Most famous for its art treasures, Florence also has manufactures of woolen and silk goods, porcelain, mosaic, hats, musical instruments, and toys.

Among the principal buildings are the cathedral, Santa Maria del Fiori, founded in 1298, palaces, and other impressive structures. In the cathedral are numerous sculptures by master artists, among them Michelangelo. Other churches contain almost an equal wealth of great productions in sculpture and painting. The celebrated buildings include the Palazzo Vecchio (or Sig-

PONTE VECCHIO IN FLORENCE

Courtesy Ernest Nash, N. Y.



nor), and the private palaces of the noble families Medici-Riccardi, Pitti, and Strozzi; most of these buildings were erected during the Renaissance period. Many eminent men were buried in the church of Santa Croce, among them Galileo, Michelangelo, Alfieri, and Machiavelli. Piazzini's monument to Dante is situated in the Piazza Santa Croce. A national library of more than 200,000 volumes and 12,000 manuscripts is located in the Pitti Palace, which also contains the celebrated Florentine gallery of art. Besides the collections of the Pitti Palace, those of the Uffizi Gallery and the Bargello enjoy world reputations. Florence has numerous literary and educational establishments, a public-school system, and institutions devoted to the arts, sciences, and higher educational interests.

Florence was founded by the Romans (in the 1st century B.C.) as the colony Florentia, close to the old Etruscan settlement of Faesulae, today Fiesole. During the Middle Ages it was made part of the papal realm in the 11th century in the reign of Pope Gregory VII, and by the middle of the 13th century had risen to commercial importance, ranking for many years as one of the first cities of Italy. An independent republic was established at Florence in 1283. About 15 years later great strife arose between rival parties under the names of Blacks and Whites, which resulted in the defeat of the latter and the banishment of the leading members, among them the poet Dante. In the 15th century the family of the Medici, originally merchants and bankers, became the rulers of the city, and it was under their influence that Florence became the leading center for early Renaissance art. Civil strife frequently upset the ruling powers of the republic, and in 1530 Florence capitulated to Charles V. Cosimo I, only surviving member of the Medici family, ruled during the mid-16th century and increased the power of Florence. As a result of the award of Tuscany as a grand duchy to Cosimo by Pope Pius V in 1569, Florence's history merged into that of Tuscany (*q.v.*). In 1860 Florence became part of Italy and was the capital of the kingdom, 1864-71.

Among the great men born in Florence are Amerigo Vespucci, Galileo, Dante, Boccaccio, Michelangelo, Leonardo da Vinci, Cellini, Andrea del Sarto, Petrarch, Machiavelli, and most of the Medici.

During World War II, Florence was liberated by American forces on Aug. 4, 1944. The Germans, who had entrenched themselves in the city of art, wantonly damaged many treasures and historic bridges over the Arno River before their retreat. Population, 1951, 390,769.

Flores (*flōr'ēs*), a large island in the Lesser Sunda (now Nusa Tenggara) group (see *Sunda Islands*), belonging to the Republic of Indonesia.

It is the largest of that island chain and lies between Flores and Sawoe seas. Of volcanic origin and remarkable for its volcanic peaks (reaching to about 8,000 ft.), it has an area of 5,509 sq. m.; its length is ca. 220 m. and its width, ca. 35 m. The chief products are maize, rice, and copra. The chief town is Ende, (pop., ca. 7,225). The Dutch extended their influence over Flores island in the latter part of the 17th century and maintained it until the establishment of the Republic of Indonesia after World War II (during which the island was occupied by the Japanese). Population, ca. 500,000.

Flores Sea, a body of water directly to the south of the Celebes and to the north of the Lesser Sunda (now Nusa Tenggara) island of Flores, belonging to the Republic of Indonesia. Flores Sea lies between the Java Sea on the west and the Banda Sea on the east.

Florey (*flō'ri*), SIR HOWARD WALTER, born in Adelaide, Australia, Sept. 24, 1898. Educated at Adelaide, Cambridge, and Oxford universities, Florey was also a Rhodes scholar. He became professor of pathology at Oxford in 1935. In 1939 Dr. Florey and Dr. Ernst B. Chain, with others, under a Rockefeller grant, began experiments to purify and to investigate the effects on harmful bacteria of Dr. Alexander Fleming's discovery, penicillin (*q.v.*). In 1944 Florey and Fleming (*q.v.*) were knighted, and in 1945 they shared the Nobel Prize for physiology and medicine with Dr. Chain, for their work on penicillin. See also *Bacteriology*.

Floriculture (*flō'ri-kūl-chūr*), the cultivation of ornamental plants. An enterprise of commercial importance in Europe for some centuries, it became significant in the U.S. only after the Civil War. In recent times, U.S. demand for the products of floriculture—including plants, shrubs, and bulbs for growing, as well as cut flowers—has increased steadily. Among the states important in floriculture are California, Colorado, Florida, Illinois, Massachusetts, and New York. Some of the most popular flowers, commercially speaking, are roses, pompon chrysanthemums, carnations, orchids, and gladiolas. See also *Gardening*; *Horticulture*.

Florida (*flōr'i-dā*), a state in the South Atlantic section of the U.S., which leads the nation in citrus-fruit and truck farming and in the production of phosphates and sponges. A major tourist center, Florida is becoming increasingly important as an industrial and commercial state.

Florida is bounded on the n. by Alabama and Georgia, on the e. by the Atlantic Ocean, on the s. by the Gulf of Mexico and the Straits of Florida, and on the w. by Alabama and the Gulf of Mexico. It ranks 22nd in size among the states and 10th in population, according to the 1960 Decennial Census of Population (the Dis-



trict of Columbia included in both rankings). The state's name comes from Spanish words meaning "Feast of Flowers," or "Easter," and was given to it by the Spanish explorer Juan Ponce de León (*q.v.*), who landed here during the Easter season. The state nicknames are the "Peninsula State," for its shape; the "Sunshine State," for its climate; and the "Everglades State," for the huge marshland found in its southern section.

Location	Between 79°48' and 87°38' W. long. and 24°30' and 31° N. lat.
Area	58,560 sq. m.
Land	54,252 sq. m.
Inland water	4,308 sq. m.
Greatest extent:	
North to south	460 m.
East to west	385 m.
Population (1960)	4,951,560
Capital city	Tallahassee
Highest point	Near Lakewood (345 ft.)
Lowest point	Sea level
Admitted to the Union (27th state)	1845
Song	"Swanee River," words and music by Stephen C. Foster
Flower	Orange blossom
Bird	Mockingbird
Motto	"In God We Trust"
Flag	See color plate in Vol. XI



FLORIDA

GEOGRAPHY

Florida is made up of a peninsula jutting 400 m. into the Gulf of Mexico and the Atlantic Ocean, and a "panhandle" section stretching along the Gulf coast south of Alabama and Georgia. Its southern tip, 1,700 m. north of the equator, is the southernmost point in the continental U.S. Along the shoreline are many low, sandy islands enclosing shallow bays. Extending southwest from the tip of the peninsula is the chain of islands known as the Florida Keys. The last link in this chain, Key West, is 130 m. from the coast and is connected with the mainland by the Overseas Highway.

Except for one hilly region along the northern border and another in the center of the state, Florida is low and flat, with an average elevation of 100 ft. The highest points in the hill regions are 345 ft. in the north and 325 ft. in the central section.

More than 160 rivers and more than 20,000 lakes of various sizes give Florida a high proportion of water to land. Lake Okeechobee, in southern Florida, although shallow, has an area of more than 1,200 sq. m. It is the largest lake in the state and the second-largest fresh-water lake in the U.S. From the lake southeastward to the tip of Florida stretches the Everglades, a vast swamp of sawgrass formed by the overflow from Lake Okeechobee, which once covered this subsea-level area. The Everglades is traversed by the Tamiami Trail, completed in 1928, which is built on footings dug down to bedrock to prevent it from sinking into the marsh.

The principal rivers of Florida are the St. Johns in the northeast, the Apalachicola and the Suwannee in the northwest, the Kissimmee in central Florida, and the Caloosahatchee in the southwest. Lake Okeechobee empties into the Caloosahatchee. Of the many canals that cross the state, some (such as the Miami Canal) drain the marshlands, while others connect the coastal bays and form part of the Atlantic Intracoastal Waterway, which runs all the way from Miami to Boston.

Saint Augustine, in northeast Florida, is the oldest continuously occupied white settlement in the U.S. Near it is Castillo de San Marcos, the oldest masonry fort in the country. Cape Canaveral, jutting into the Atlantic midway on Florida's east coast, is a famous missile-testing center and the site of the launchings of U.S. astronaut space flights. Although the base is closed to the public during launchings, nearby vantage points give a view of the take-off of the giant missiles. Miami Beach, near the southern tip of Florida on the Atlantic coast and across a narrow lagoon from the city of Miami, is one of the best-known resorts in the U.S. Tarpon Springs, on the Gulf coast, is the home



of the sponge-fishing fleet. Key West, the southernmost city of the U.S., has a West Indian appearance, and Spanish is still spoken on its narrow streets.

Climate: Northern Florida's climate is warm-temperate. Although the winter has occasional short cold spells, the temperature seldom falls below 60° F. Southern Florida is subtropical, with winter temperatures ranging in the high 60's. In both northern and southern Florida, summer is hot, and humidity and rainfall are

high; frequent and usually brief showers, however, have a cooling effect. The rainy season in northern Florida is from June to November; in southern Florida, from August to October.

NATURAL RESOURCES

Florida's most important natural resource is its sunny climate, the base of both its agriculture and its tourist trade. The resorts that dot the Florida coast offer swimming even in winter. In the farming regions of the central and southern parts of the state, there is seldom either snow or frost; citrus-fruit and truck crops can therefore be grown when their selling price is highest in the northern cities. The warm winters and heavy rainfall allow year-round outdoor pasturing of livestock.

Forests cover 23,047,000 acres, and the total stand of live sawtimber is 23,032,000,000 bd. ft. Softwoods make up about 72.6 per cent of the growing stock, and hardwoods, 27.4 per cent.

Florida leads the nation in deposits and production of phosphates, and this resource accounts

	Miami	Jacksonville
Normal temperature		
January	68.5° F.	57.3° F.
July	81.6° F.	81.7° F.
Annual mean	75.3° F.	69.8° F.
Latest frost	None	Feb. 15
Earliest frost	None	Dec. 11
Precipitation		
January	2.15 in.	2.82 in.
July	4.36 in.	7.89 in.
Annual	47.20 in.	52.30 in.
Average growing season	365 days	299 days

for about half the state's mineral output. The phosphates are converted into fertilizers and other chemical products, and uranium is extracted from their wastes. Next in importance among the mineral resources are limestone, used for Portland cement and building stone, and pottery clays. There are small deposits of titanium, ilmenite, rutile, zircon, monazite, and garnet sands. Some petroleum has also been discovered.

Florida's waters are heavily stocked with fish. Among the important catches are shrimp and other shellfish, sea turtles, red snapper, mullet, and pompano.

Conservation activities include the regulation of the fishing and shellfishing industries, the draining of marshlands, and reforestation work. Many refuges have been set aside to preserve the unusually beautiful wild birds of the region.

FLORIDA'S ECONOMY

At the time of the 1960 census, Florida had an employed population of 1,719,591. Of this total, ca. 13 per cent were in manufacturing; 9 per cent in construction; 7 per cent in agriculture, forestry, and fisheries; and 0.4 per cent in mining. The remainder were employed in the wholesale and retail trades, in government, and in supplying personal, professional, and other services.

The leading manufacturing industry is the processing of foods, particularly of fruits, vegetables, dairy products, and fish. The production of chemicals, including agricultural chemicals, is next in value, followed by the manufacture of paper and allied products and of fabricated metal products. The state's total value added by manufacture in 1961 was \$1,908,958,000.

There were 45,100 farms in 1959, occupying a total of 15,237,000 acres. The average farm had 338 acres, with land and buildings valued at \$73,554. Much of the farm land now under cultivation was once Everglades swampland, which

has been drained by an extensive system of canals and has only come into use since the 1940's. The farms, with the forests and commercial fisheries of Florida, provide the base for state's most important manufacturing operations.

Florida's climate is favorable for the growing of citrus fruits, which are the major agricultural commodity of the state. Normally the state provides well over half of the U.S. citrus supply, and its crop of oranges, grapefruit, tangerines, tangelos, lemons, and limes accounts for about 40 per cent of total farm marketing receipts. The state is also a leading supplier of many vegetables and other truck crops, including tomatoes, snap beans, sweet corn, green peppers, celery, watermelons, and cucumbers. Sales of these and other crops, including tobacco, potatoes, and sugarcane, regularly provide about three-quarters of all farm marketing receipts. Livestock and livestock products, especially milk, beef animals, eggs, and hogs, account for the remaining quarter of receipts. In 1961 the total income from sales of crops, livestock, and livestock products amounted to \$867,642,000.

The state's commercial fisheries are located both on the eastern coast and on the Gulf of Mexico. In 1960 the commercial catch of fisheries on both coasts totaled 196,946,000 lb. and was valued at \$26,828,000.

Florida's mineral output was valued at \$190,333,000 in 1960, comprising 1.05 per cent of the total U.S. value and placing the state 23rd among the states. The principal minerals, in order of production value, were phosphate rock, stone, cement, and clays.

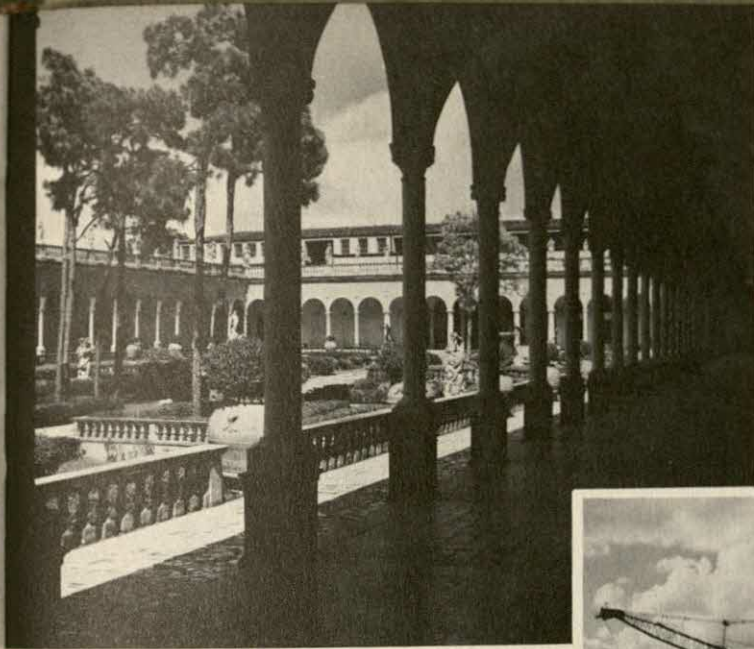
TRANSPORTATION AND COMMUNICATION

Florida's long coast line makes water transportation important. The state has more than 2,000 m. of navigable rivers and lakes, and it is connected with cities on the East Coast farther north by the Atlantic Intracoastal Waterway. Among Florida's 17 ports of entry, the busiest are Tampa, Jacksonville, and Miami.

Several major railroads serve Florida, including the Atlantic Coast Line R.R.; the Seaboard Air Line R.R.; the Florida East Coast Ry.; the Georgia Southern & Florida Ry.; the Louisville & Nashville R.R.; and the St. Louis-San Francisco Ry. Total railroad mileage in 1956 was 4,691 m. The first railroads in Florida were the Lake Wimico and St. Joseph R.R., opened in 1836 and now abandoned; and the Tallahassee R.R., opened in 1837, now part of the Seaboard Air Line R.R. In 1960 Florida had 69,216 m. of rural and municipal roads, of which 21,622 m. were unsurfaced. Large airports serve most cities of the state. Miami is the terminal point for many Latin-American flights. In 1961 there were 189 radio stations and 17 television chan-

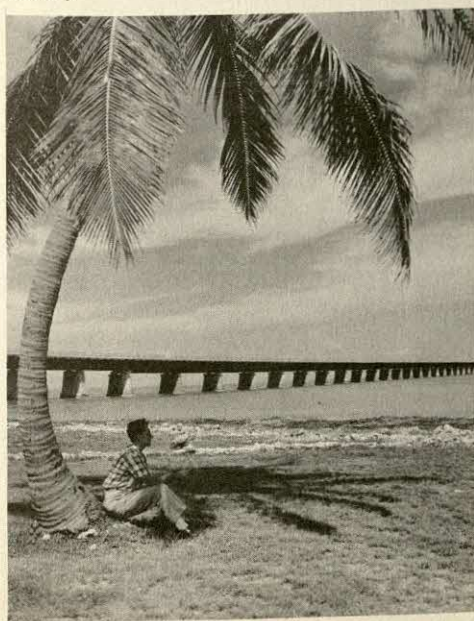
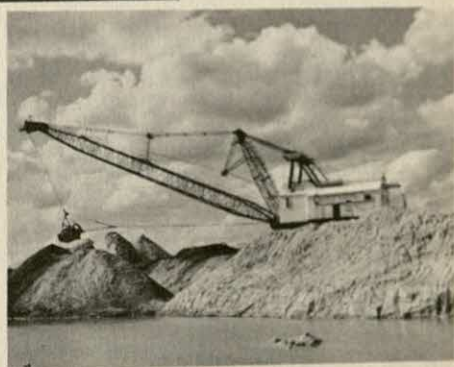
ANNUAL STATE EVENTS

Blessing of the Sponge-Fishing Fleet	Jan. 6; Tarpon Springs; celebration of Greek Orthodox sponge fishermen; procession
Florida State Fair	Midwinter; Tampa; includes Gasparilla Festival, a week-long carnival honoring legendary pirate José Gaspar
Cuban Independence Day	Feb. 24; Key West
National Stock Car Championships	February; Daytona Beach
Citrus Exposition	February; Winter Haven
Southeastern Fat Stock Show	March; Ocala; cattle show
National Fresh Water Bass Tournament	March; Leesburg
Florida International Grand Prix of Endurance	March; Sebring; motor races
Tarpon Tournaments	May to August; Sarasota and Tampa
Singing Tower Carillon Concerts	December to April; Mountain Lake Sanctuary, near Lake Wales



FLORIDA AT WORK AND PLAY

The John and Mabel Ringling Museum of Art (*above*), at Sarasota, is a replica of a 16th-century Florentine building and houses the nation's largest collection of the works of the Flemish master Peter Paul Rubens. Phosphate mining (*top right*), in which Florida ranks high in the world, is only one of the state's booming productive industries. Shrimp fleets bring in their hauls (*center right*) from the Gulf coast. Millions of tons of shrimp are whisked away to northern markets in caravans of refrigerated trucks. To the delight of tourists, who visit the state the year round, a friendly porpoise (*bottom right*) leaps high out of a tank at the Miami Seaquarium. The longest bridge on the Overseas Highway (*below*), sometimes called "the highway that goes to sea," runs from the mainland down to Key West (courtesy *Florida State News Bureau*)



FLORIDA

nels. The first newspaper published in the state was the *East Florida Gazette*, established in 1783 in St. Augustine. Among today's leading newspapers are the *Miami Herald and News*; the *Florida Times-Union*, Jacksonville; and the *Tampa Tribune*.

POPULATION

Florida has 67 counties. The 1960 census population was 4,951,560 (1962 est. population, 5,459,000), an increase (the largest of any state) of 78.7 per cent over 1950. The urban population comprised 3,661,383, or 73.9 per cent; the rural population 1,290,177, or 26.1 per cent. Between 1950 and 1960 the urban population rose 101.9 per cent, and the rural population, 34.8 per cent. Almost two-thirds of the urban population lived in the urbanized areas of Miami, Jacksonville, St. Petersburg, Ft. Lauderdale-Hollywood, Tampa, and Orlando. In 1960 white persons in the state numbered 4,063,881; of the 887,679 nonwhites, 880,186 were Negroes and 2,504 were Indians, the remainder including Filipinos, Japanese, Chinese, and others. Florida's native-born residents totaled 4,680,627; the foreign-born totaled 272,161. Population density averaged 91.3 per sq. m.

The major religious bodies are the Christian Churches, International Convention (Disciples of Christ), Jewish congregations, The Methodist Church, the Presbyterian Church in the U.S., the Protestant Episcopal Church in the U.S.A., the Roman Catholic Church, and the Southern Baptist Convention.

Chief Cities: Miami, at the mouth of the Miami River on the Atlantic coast, is the largest city. A port and year-round resort, it is the center of the nearby fruit-growing industry.

Tampa, the second-largest city, on the Gulf coast at the head of Tampa Bay, is a port, a railroad center, and a leader in cigar-making.

Jacksonville, the third-largest city, in the northwest, is a port, railroad junction, and financial and manufacturing center.

St. Petersburg, the fourth-largest city, a port midway on the Gulf coast, is well known as a health and recreational resort.

Tallahassee, in the northwestern panhandle, is the state capital.

Famous Men and Women: Bok, Edward William (1863-1930), writer and editor, who financed the Singing Tower at Mountain Lake Sanctuary, Lake Wales.

Flagler, Henry M. (1830-1913), financier, railroad and hotel builder.

Gorrie, John (1803-55), inventor of artificial refrigeration.

Johnson, James Weldon (1871-1938), Negro writer, editor, and educator, who helped to found the National Assn. for the Advancement of Colored People.

FLORIDA

Kirby-Smith, Edmund (1824-93), Confederate officer; last to surrender in Civil War.

Rawlings, Marjorie Kinnan (1896-1953), author, whose novel "The Yearling" was set in a Florida wilderness.

Stilwell, Joseph Warren (1883-1946), general, U.S. Army, who commanded the Burma campaign in World War II.

EDUCATION

Education is free and compulsory for children between seven and 16. The state's public-school system was established in 1869. In 1962 public-school enrollment totaled 1,093,941, and there were 49,785 enrolled in Roman Catholic parochial schools in 1961. The leading state-supported institutions of higher learning include the Univ. of Florida, Gainesville; Florida State Univ. and Florida Agricultural and Mechanical Univ., Tallahassee. Private or denominational institutions are the Univ. of Miami, Coral Gables; Rollins Coll., Winter Park; Florida Southern Coll., Lakeland; and Stetson Univ., De Land. Cultural institutions include the Ringling Museum of Art, Sarasota; the Vizcaya-Dade County Art Museum, Miami; and Marine Studios, Marineland, with many live specimens of underwater life. In St. Augustine are the Lightner Museum of Hobbies and what is believed to be the oldest house in the U.S. The Beal-Maltbie Museum, Winter Park, has one of the world's largest collections of sea shells. Near Miami is an 800-year-old Spanish monastery, which was transported to the U.S. in sections. At the Florida State Museum, Gainesville, are many mementoes of the state's history.

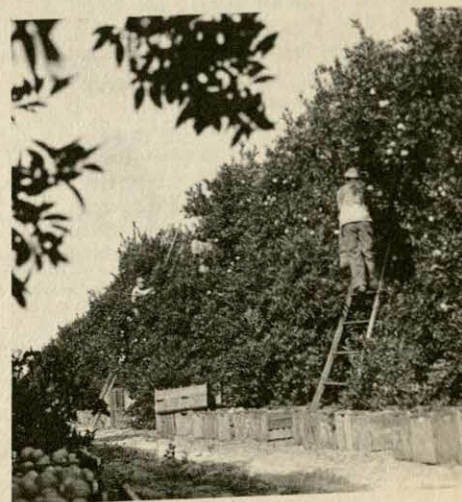
GOVERNMENT

Florida is governed under provisions of a constitution adopted in 1885 and amended many times. The constitution gives executive authority to a governor, secretary of state, controller, attorney-general, treasurer, superintendent of public instruction, and commissioner of agriculture, all elected to four-year terms, and all save the governor permitted to succeed themselves. The legislature consists of a senate of 38 members elected to four-year terms, and a house of representatives of 95 members elected every two years. The legislature meets in Tallahassee, the capital city, for regular sessions on the Tuesday after the first Monday in April of the odd-numbered years. The length of the regular session is limited to 60 calendar days. The supreme court consists of seven justices, each elected for six years. There are three district courts of appeal and 16 circuit courts, as well as county, probate, and local courts. Florida is represented in the U.S. Congress by two Senators and 12 Representatives.



IMPRESSIONS OF FLORIDA

A part of the U.S. Navy's "mothball fleet" (above), at Green Cove Springs, affords an unusual attraction for tourists. Hundreds of warships, in semiretirement, are lined up along the wide concrete pier. The Cistercian monastery (top right), in North Miami, is another popular tourist feature. Its Romanesque- and Gothic-style architecture furnish a fascinating contrast to ultramodern Miami—the playland of the nation. Florida's many reminders of the past are illustrated by the ancient city gates of St. Augustine (center right) and a Seminole Indian woman (below) attending to her grandson and a cook fire simultaneously (courtesy Florida State News Bureau). The gates are remnants of the city's history; founded in 1565, it is the site of the oldest permanent European settlement in North America (courtesy St. Johns County Chamber of Commerce). Citrus fruit (bottom right) is Florida's largest crop. With its semitropical climate, the state produces almost three-quarters of all the citrus fruit grown in the nation (courtesy Florida State News Bureau)



HISTORY

Juan Ponce de León, who had accompanied Christopher Columbus on his second voyage to the New World, was the first white man to set foot on Florida. He landed in 1513 and made a prolonged exploration of the region. Earlier explorers had sighted the coast, and an area that appears to be Florida is shown on a Spanish map dated 1502. Ponce de León made a second visit in 1521, but he was mortally wounded by Indians. Two other Spaniards were among the early explorers of Florida. Pánfilo de Narváez landed on the Gulf coast in 1528 and made an unsuccessful search for gold; he and his party were lost sailing for Mexico. Fernando de Soto landed near the same spot, in 1539, to begin the cross-country expedition that led to his death. In 1559 Tristán de Luna established a colony at Pensacola Bay, but it failed after two years.

The first permanent white settlement was established in 1565 at St. Augustine, which was a base for Spanish military forces under Pedro Menéndez de Avilés. When Menéndez took part of his troops on a successful expedition against the French Huguenot colony at Ft. Caroline, on the St. Johns River, the soldiers who did not accompany him remained at St. Augustine, and it has been inhabited continuously since that day. French revenge against Menéndez came in 1567-68, when an expedition under Dominique de Gourgues recaptured Ft. Caroline (now San Mateo) and executed its garrison. In 1586 St. Augustine was burned by the English adventurer, Sir Francis Drake.

For two centuries, the Spanish held Florida in a tenuous grip; many of their settlements were raided by the French and the English.

From 1763 to 1783 the territory was held by the British, who had defeated Spain's ally, France, in the French and Indian War. In 1783, by trading the Bahama Islands to the British, Spain regained Florida. She did not maintain a large enough army in the colony to assure firm control, however, and raids over the border into Georgia by Indians, bandits, and runaway slaves brought a series of disputes with the new nation to the north. In 1814 and again in 1818, Gen. Andrew Jackson led troops into Florida. Over Spain's weak protest, the British had established a base at Pensacola, but Jackson forced their withdrawal in 1814; during the 1818 expedition, the U.S. came close to war with England when Jackson hanged two British citizens accused of stirring up the Indians.

In 1819 the U.S. purchased Florida for \$5,000,000, all of which was paid to American citizens with claims against Spain. Jackson was appointed first governor of the new territory in 1821.

In 1835 the bitter and costly Seminole War began, with Gen. Zachary Taylor, later President, leading U.S. troops against Osceola. The Indian chief was captured in 1838 while under a flag of truce, but the Seminoles continued to fight until 1842, and they still have not signed a peace treaty. Florida was admitted to the Union as the 27th state on March 3, 1845, the last day of President John Tyler's administration.

As the Civil War neared, Florida seceded from the Union on Jan. 11, 1861, and seized control of most Federal forts within the state, although Ft. Pickens, at Pensacola, and Key West remained in Union hands throughout the war. Florida's bays and rivers provided hiding places for blockade runners, ships which darted back and forth to the nearby West Indies trading

MAJOR RECREATIONAL AND HISTORIC FEATURES

Name and Type	Size and Location	Points of Interest
Everglades National Park (established 1937)	1,400,533 acres in southern Florida (U.S. 27, 41)	Largest remaining subtropical wilderness in the U.S.; mangrove and cypress forests; wild birds and alligators
Castillo de San Marcos National Monument (established 1924)	22 acres, near St. Augustine (U.S. 1)	Oldest masonry fort in the U.S., begun in 1672 by the Spanish
Ft. Jefferson National Monument (established 1935)	47,125 acres on island of Dry Tortugas, off the southwest coast	Largest masonry fort in Western Hemisphere, begun in 1846; Union prison in Civil War; bird sanctuary, marine life
Ft. Matanzas National Monument (established 1924)	228 acres, near St. Augustine (state A1A)	Spanish fort built in 1737; near site of Menéndez's massacre of Huguenots in 1565
De Soto National Memorial (established 1949)	30 acres, 4 m. W. of Bradenton (off U.S. 41)	Probable site of Fernando de Soto's landing in 1539
Apalachicola National Forest (established 1936)	631,636 acres, near Tallahassee (U.S. 90, 98, 319; state 20, 65, 375)	Coastal-plain forests; hardwood swamps; Old Ft. Gadsden; wildlife area
Ocala National Forest (established 1908)	429,210 acres, near Ocala (U.S. 41, 17, 301; state 19, 40, 42)	Wilderness portrayed in Marjorie Kinnan Rawlings' "The Yearling"; springs and lakes; pine forests; annual deer and bear hunting
Osceola National Forest (established 1931)	161,814 acres, near Lake City (U.S. 41, 90, 441)	Near site of Civil War battle of Olustee; ponds and cypress swamps; game-breeding ground
Florida Caverns State Park (established 1935)	1,131 acres, near Marianna (off U.S. 90)	Florida's largest cave; limestone formations; natural bridge
Highlands Hammock State Park (established 1931)	3,800 acres, near Sebring (off U.S. 27)	Subtropical jungle; alligators, raccoons, and deer; 900-year-old oak trees
Torrey State Park (established 1935)	1,063 acres, 15 m. N. of Bristol (off state 20)	Rare <i>Torrey taxifolia</i> cedars; fine pre-Civil War mansion



Courtesy City of Miami News Bureau

MIAMI, FLORIDA

Free concerts under the stars are a regular feature of the city's spring and summer recreational program

cargoes of cotton, tobacco, and turpentine for munitions and luxury goods for the Confederacy. Union forces tried and failed to cut the Confederate supply line at the battle of Olustee (1864). During the Reconstruction period, "carpetbaggers" caused much havoc in Florida.

In the presidential election of 1876, two sets of electors arrived at Tallahassee, each charging the other with fraud. In the years after the Reconstruction and the state's readmission (1868) to the Union, however, Florida grew quickly. The two railroads that had been established in the 1830's were linked with each other and with northern railroads. The foundation of the Florida citrus-fruit industry was laid in the 1880's, when superior varieties of oranges and grapefruit were developed. Phosphate deposits were discovered in 1888.

In the Spanish-American War, the Rough Riders and other troops trained in Florida and sailed for Cuba from Tampa, Jacksonville, and Miami. Florida also trained military personnel in World War I and sent 42,156 residents to serve in that conflict. In World War II, 254,358 men and women from Florida served in the armed forces, and the huge hotels in its resort cities provided housing for soldiers, sailors, and fliers who received their training in the state.

In 1950 the missile-test center at Cape Canaveral launched its first missile, a captured German V-2 rocket. Years of experimentation followed, until on Jan. 31, 1958, the first U.S. space satellite, Explorer I, soared into orbit.

See also separate entries on most of the individuals and geographical and historical subjects mentioned in this article.

Florida, BAY OF, a body of water between the southern tip of Florida and the Florida Keys (*q.v.*). It is separated from the Straits of Florida (*q.v.*) only by the keys.

Floridablanca (*flō-rē-THä-bläng'kā*) or FLORIDA BLANCA, JOSÉ MOÑINO, CONDE DE, statesman, born in Hellín, Spain, Oct. 21, 1728; died in Seville, Dec. 20, 1808. For his efforts in behalf of Spain's anti-Jesuit policy, Floridablanca was ennobled and appointed Spanish premier by Charles III of Spain. His premiership (1777-92) was characterized by absolutism, but it was also noted for the reforms, particularly economic, which he instigated. He also settled a dispute with Portugal over the boundaries of South American colonies, unsuccessfully tried to prevent Spain from being drawn into war with England during the American Revolution, and advocated a coalition against France during the French Revolution. He was president of a junta opposing Napoleon's invasion in 1808.

Florida Keys (*flōr'i-dā*), a long chain of islands which extend for almost 200 m. around the southeastern tip of Florida from Biscayne Bay into the waters of the Gulf of Mexico. Part of Florida, the group includes hundreds of islands of coral and limestone formation, the largest of which is Key Largo, and the best-known, Key West. Most of the islands, if habitable at all, are thinly populated, and the only industries of importance are fishing, tourism, and, at Key West, cigar-making. The principal city of the keys is Key West, with its port and naval base. The famous Overseas, or "seagoing," Highway, crossing from the mainland at Key Largo, follows the chain of islands over land,

products made of wheat. When applied to the finely ground substance of any other cereal it is usually specified, as rye flour, buckwheat flour. Among the principal food products flour is of vastly greater importance than any other. It is used in many forms, such as bread, biscuit, cake, pudding, and crackers. Rice, the favorite food of many Asiatics and an important food among other peoples, is the only cereal that rivals flour as food for man. The cultivation of cereal plants is as old as the history of the race.

Various relics of remote antiquity indicate that crude devices were employed in the manufacture of flour from wheat and rye. The process consisted of crushing the grains in a cavity cut in stone by means of a conical piece of porphyry, crystal, or marble. In the later period of ancient Egypt and the early times of Rome, the pestle and mortar which served for crushing grain were soon displaced by the ox mill and later by the water mill. In early water mills the process of grinding was effected by an upper and a lower millstone, which had flat surfaces. The grain passing between the two in a slow stream was ground to a mixed mass of flour, middlings, and bran, each of which was afterward separated from the others.

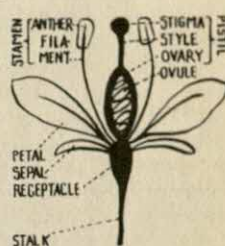
In modern flour milling it is customary to convey the wheat from the railway cars in which it is shipped from the agricultural districts into bins located in a huge grain elevator (*q.v.*) adjoining the mill. These bins are usually of concrete or steel, from 25 to 50 ft. in diameter and about 100 to 120 ft. high, and store the wheat until it is ground. When the wheat is brought into the mill, it is first elevated to the top of the building where it is fed by gravity through the various cleaning machines to remove oats, chaff, dirt, iron particles and any other foreign matter. The wheat is then elevated again to the top of the building into tempering bins where it is further prepared for milling operations. After each grinding operation the product is again elevated and run through grading machines known as sifters, and through purifiers, and again reground and re-elevated for more regrading and purification. After many repetitions of this process the crushed wheat has become finished flour ready for packing. Many different types and grades of flour are produced.

Kansas, New York, Minnesota, and Missouri are the leading states in flour milling in the U.S., according to the 1954 Census of Manufactures. The major cities are Buffalo, Kansas City, and Minneapolis. The same census reported that the value added by the manufacture of flour and meal was \$326,717,000. The annual U.S. production of flour is *ca.* 11,500,000 tons. In recent years, the per-capita consumption of flour (in foods containing flour) has decreased. Americans consumed 157 lb. each in the period 1935-39, but they ate only 119 lb. of flour in 1956.

Canada, with its vast wheat fields in its western central plains, ranks high in the production of flour for the world market. It exported some 871,100 tons in 1955-56. Flour milling is an important industry in Manitoba and Saskatchewan, and Winnipeg and Saskatoon are major flour-producing cities.

Flower (*flou'ēr*), the blossom of a plant, the part responsible for seed formation. The parts of the flower grow from the receptacle, the knoblike tip of the stalk.

A complete flower has four kinds of parts. In the center is a pistil. Its bulbous basal part is the ovary, containing one or more egg-shaped ovules, and its knoblike tip is the stigma, sometimes raised on a threadlike style. In a circle around the



PARTS OF A FLOWER

pistil are the stamens, from a few to many (see the drawing of a lengthwise slice cut out of the middle of a flower). A stamen consists of a threadlike stalk (filament) with an enlarged anther at its tip. In the anther the pollen, a fine powder, is produced. Outside of the stamens is a circle of petals, commonly three to five in number, and usually leaflike in form, but bright-colored. Petals are the most conspicuous part of the flower and often attract insects. All the petals together form the corolla. Outside of the petals is a circle of sepals, commonly of the same number as the petals. The sepals are usually leaflike and green and protect the inner parts in the bud stage. All the sepals together make up the calyx. (Sometimes, as in lilies, the sepals resemble the petals.) The sepals and petals are *accessory* parts of the flower, *i.e.* not directly connected with seed formation; they are lacking in the flowers of such plants as grass as well as of many trees. The stamens and pistils are the *essential* parts for seed formation. Some kinds of plants, such as squash, oaks, and hazelnuts, have stamens and pistils in separate flowers on the same individual; corn has stamens in the flowers of the tassel, pistils in those of the ear on the same plant. Others, such as willow and ginkgo trees, bayberry bushes, and hops, have stamens and pistils on separate plants. For seeds to be formed, pollination is necessary, *i.e.*, the transfer of pollen from the anther to the stigma in the same flower or another flower on the same kind of plant or a closely related kind. The anther splits when the pollen is ripe. The pollen may simply fall from the anther to the stigma or may float in the wind or be carried by insects. The stigma exudes a sweet solution, which stimulates a grain of pollen to germinate, or grow out into

a tubelike form. This pollen tube grows down into an ovule and discharges into it a tiny sperm nucleus (male) which unites with the tiny egg nucleus (female) in the ovule. This union (fertilization) marks the beginning of the embryo or new plant. As the embryo develops, the whole ovule enlarges and ripens into a seed, and the ovary grows and ripens into a fruit: a fleshy fruit, such as a cherry, or grape, or orange, or a so-called dry fruit, like a pea pod, or lily capsule, or nut. When the seed sprouts (germinates) the embryo develops into a new plant of the kind that bore the flowers.

See also color plates, *Flowers of the World I and II*; *Flowers of North America*; *Flowers of North America and Africa*; *American Cacti I and II* in Volume V; *Exotic and Native Orchids* in Volume VIII.

Flower, ROSWELL PETTIBONE, banker and politician, born in Theresa, N.Y., Aug. 7, 1835; died May 12, 1899. He worked as a farmhand, as a clerk, and as a jeweler in Theresa. In 1869 he became a banker in New York City. In 1881 he was elected as a Democrat to Congress, serving for two years, and was elected again in 1888. In 1891 he became governor of New York. In 1895 he retired from politics to manage his business interests. A noted philanthropist, he donated funds for the building of the Flower Hospital in New York and of other charitable enterprises.

Flowers (*flaw'ērz*), ADOPTION OF, the selection of flowers as symbols by states and nations. Floral symbols came into use in early times and are mentioned in the early history of China and in Biblical literature. The lotus, or sacred lily, was consecrated to the gods in Egypt, and afterward became the national emblem. Many nations of antiquity used a code of floral symbols in decorating the surfaces of monuments and in making inscriptions in temples, but these are not understood. Throughout history is a line of records that conveys information in regard to the extensive use of flowers in national ceremonies, but the selection of particular flowers came about rather by sentiment than by legal or national adoption. Edward I of England wore the red rose, from which circumstance the rose became the national emblem of that country. However, the British coat of arms contains the English rose, the Irish shamrock, and the Scotch thistle. In Canada the national emblem since 1834 has been the leaf of the sugar maple, renowned for the brilliant colors of its foliage in autumn. The following is a partial list of national emblems:

Canada	Maple Leaf	Italy	White Lily
England	Rose		Chrysanthemum
Egypt	Lotus	Japan	Prickly Pear
France	Fleur-de-lis, or Iris	Mexico	Rose
Germany	Cornflower	Persia	Scarlet
Greece	Blue Violet	Spain	Pomegranate
India	Lotus	Switzerland	Rare Edelweiss
Ireland	Shamrock	United States	Goldenrod

For the flowers selected by the states of the U.S., see color plates, *State Flags and Flowers I, II, and III* in Volume XI.

Flowers, ARTIFICIAL. The materials used in making artificial flowers include wax, shell, horn, whalebone, paper, rubber, ribbons, velvet, cambric, jaconet, calico, muslin, blown glass, crape, gauze, satin, bamboo, and feathers.

Flowers, LANGUAGE OF, the method of using flowers as symbols to express thoughts and feelings. The art of using flowers to convey messages originated in ancient times, when the custom was better understood and more generally practiced than at present. An extensive flower language was developed in the western part of Asia at a remote period, but the Greeks and Romans conveyed to us the most authentic record of its use and application. Though nations widely remote from each other cultivated the use of such a language, it is interesting to note that they attributed the same sentiment to many of the flowers. For instance, the amaranth signifies immortality; the oak leaf, power; the moss rosebud, a confession of love; and the white rose, happy love. The following is a partial list of the more important flowers used in expressing sentiments:

Amaranth	Immortality
Anemone	Anticipation
Apple Blossom	Preference
Aspen Leaf	Fear
Brier	Insult
Buttercup	Riches
Camellia	Illness
Calla	Pride
Candytuft	Indifference
Cornflower	Heaven
Cowslip	Youthful Beauty
Cypress	Death
Daffodil	Unrequited Love
Daisy	Simplicity
Dandelion	Coquetry
Evergreen	Hope
Everlastings	Undying Affection
Fern	Forsaken
Five-leaved Clover	Bad Luck
Forget-Me-Not	True Love
Four-leaved Clover	Good Luck
Foxglove	Insincerity
Geranium	Deceit
Goldenrod	Encouragement
Heather	Loneliness
Heliotrope	Devotion
Hepatica	Anger
Honeysuckle	Fidelity
Hyacinth	Sorrow
Ivy	Trustfulness
Laurel	Fame
Lilac	Fastidiousness
Lily	Majesty, Purity
Lotus	Forgetfulness
Marigold	Contempt
Moss, or a dry twig	Old Age
Myrtle	Wedded Bliss
Narcissus	Vanity
Oak Leaf	Power
Orange Blossom	Marriage

Oxalis	Pangs of Regret
Palm Leaf	Conquest
Pansy	Loving Thoughts
Poppy	A Tryst at Evening
Rosemary	Remembrance
Rue	Repentance
Scarlet Geranium	A Kiss
Snowdrop	A Friend in Need
Sting Nettle	Rudeness
Sweet William	Gallantry
Tuberose	Bereavement
Tulip	Boldness
Violet	Modesty
Yellow Rose	Jealousy

Floyd (*floid*), JOHN BUCHANAN, statesman and soldier, born in Blacksburg, Va., June 1, 1807; died Aug. 26, 1863. He attended the Coll. of South Carolina, was admitted to the bar, and practiced law in Arkansas and Virginia. In 1847 he was elected to the Virginia legislature, and became the governor of that state in 1850. From 1857 to 1860 he was Secretary of War, but resigned in the latter year to join the Confederate States. The following year he became a brigadier general in the Confederate Army and commander of Ft. Donelson, where he was defeated, and soon after was relieved of his command.

Fluids (*flood'idz*), the substances whose molecules change places freely by slight pressure. They include liquids and gases, as opposed to solids. Liquids possess no definite shape, but assume that of the vessel in which they are kept, except at the upper surface, which is level. Gas enclosed in a bottle presses upward against the cork as well as against the sides and base. From this fact liquids are said to be nonelastic fluids and gases are termed elastic fluids.

Flukeworm (*flood'h'wurm*) of FLUKE, the name of several kinds of worms found in the liver and biliary ducts of sheep, in which they cause the disease commonly called *rot*. The eggs, which are laid in the liver, pass to the exterior by means of the gall and intestines and hatch on wet grass. After undergoing a complicated process of development, they crawl about on the grass and are eaten by the sheep. Inside of the stomach they undergo another form of metamorphosis. Later they bore through the animal tissue and find lodgment in the liver, where they reach sexual maturity. Other species attack birds and fish, and a kind common to Egypt infests different organs and tissues of man.

Fluorescence (*flood-ô-rës'ens*), the property possessed by some transparent bodies which causes them to produce at their surface, or within their substance, light of a different color than that of the mass of the material. This may be demonstrated by exposing green crystals of fluor spar (*q.v.*) to light, when the reflections are blue. The reflections are due to the property which the substance has of modifying the light striking upon it. Glass colored a yellow tint with oxide

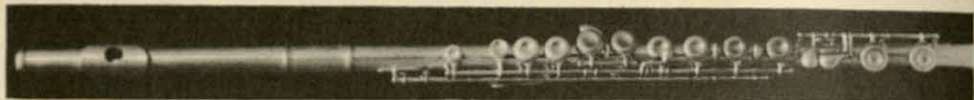
of uranium, known as canary glass, produces fluorescence of a brilliant green color. The effect of fluorescent materials on light rays is employed in the fluorescent lamp. See also *Electric Light*.

Fluoridation (*flood-ô-rî-dâ'shun*), the process of adding fluoride to public water supplies for the purpose of preventing tooth decay. Extensive research has shown that children who, from birth, drink water containing one part per million of fluoride have up to 65 per cent less decay. Major U.S. health organizations have approved fluoridation, and it is now employed in approximately 1,800 public water-supply systems serving 35,000,000 Americans.

Fluorine (*flood'ô-rën*), a chemical element having an atomic number of 9 and average atomic mass of 19. The element is the most reactive of all the non-metals and occurs in nature only in the combined form such as calcium fluoride (fluorite) and cryolite (sodium aluminum fluoride). It is found in plants, mineral springs, sea water, and in the teeth. Hydrogen fluoride, a weak acid, is prepared from sulphuric acid and calcium fluoride. It has the unusual property of attacking glass. In the anhydrous form it catalyzes organic reactions. Sodium fluoride is an insecticide.

Fluoroscope (*flood'ô-rô-skôp*), a fluorescent screen to convert X-rays (*q.v.*), cathode rays, or radioactive rays into visible light. In principle, fluorescent materials absorb light quanta and give back this energy at lower, visible frequencies. In 1895, Wilhelm Konrad Roentgen (*q.v.*), while investigating electric discharges in vacuum tubes, found that certain rays caused barium-platinum compounds to fluoresce, and that the bones in his hand were visible as dark shadows on a screen coated with these compounds, when he held his hand between the source of the rays and the screen. Thomas A. Edison (*q.v.*) applied this principle to the invention of a practical apparatus for observing the body during X-ray examination. Essentially the fluoroscope is a cabinet with a screen coated with calcium tungstate crystals or barium platinocyanide. The object to be observed is placed between the X-ray source and the screen. For permanent record of X-ray patterns, photographic film or plates are used to record the image directly from the X-rays, which affect photographic materials in the same manner as light.

Fluorspar (*flood'ûr-spâr*) or FLUORITE, the fluoride of calcium, which occurs especially in deposits of metallic minerals. It is usually shades of blue, green, yellow, or red, though it also occurs in colorless and transparent forms. Fluorspar is found in England, Germany, Italy, and Norway. The annual U.S. product, valued at *ca.* \$15,000,000, is obtained chiefly in Illinois and Montana. It is used as a flux in iron



Courtesy Carl Fischer Musical Instruments Co., N. Y.

MODERN FLUTE

smelting, and in the manufacture of opalescent glass and hydrofluoric acid.

Flute (*flüt*), a wind instrument consisting usually of a cylindrical tube with holes along its length which are stopped by the fingers or by keys operated by the fingers. Most modern flutes are closed at the upper end, and have a hole across which the player blows transversely, thus causing the air column inside the tube to vibrate. Flutes are commonly made of silver, occasionally of wood. The flute has a range of three octaves above middle C and produces one of the brightest, most piercing tones in the orchestra. One of the oldest wind instruments, the flute was known in various forms in ancient Assyria, Egypt, and Greece.

Flux (*flûx*), a substance used to promote the fusion of minerals. Since limestone unites with the alumina and silica of iron ores, it is the flux usually employed in the blast furnace. Borax forms fusible compounds with silica and other bases and is used very generally as a flux. Fluor spar (calcium fluoride) is used as a flux in making steel and in other metallurgical operations. Many substances, such as litharge, boric acid, and red lead, are used as fluxes in making pottery.

Fly (*flī*), an insect characterized by possessing but two wings, the posterior set being reduced to a pair of halteres or balancers. In some species like the house fly the proboscis or underlip ends in two flaps, which are used for lapping. Many have a piercing beak. The order Diptera, or two-winged insects, comprises a long list of pests, such as gadflies, bat flies, blowflies, and the common house flies. About 40,000 species have been described, but these are thought to be only about one-eighth of the number which are at present represented by living species. To these may be added a long list of extinct and fossil flies. Not less than 1,500 species have been described from the fossils found in the shale beds of Florissant, Colo., and many other sources are fully as prolific.

The eggs of the house fly under favorable temperature conditions hatch into larvae in a few days. The larvae reach their full size in six to eight days. They then pass into a quiescent pupa stage for several days, after which they issue as full-grown insects. In warm climates flies are seen the entire year, but where the winters are cold they disappear on the approach of heavy frosts. A few survive the winter in sheltered places. These, together with some of the eggs and pupae, preserve the species. Flies are enabled to walk on smooth surface and ceilings with their backs downward by a hairlike cushion which serves to

hold them in place, partly by a glutinous fluid secretion and partly because of their ability to remove the air from below the feet by means of suckers through the hair, the pressure of the air on the outside serving to support the insect. The muscid, or house fly, and the syrphus, or drone fly, are well-known species of these insects. See also *Insects*.

Flycatcher (*flī'käch-ēr*). See *Tyrant Flycatcher*.

Flying Dutchman (*flī'ing düch'man*), a spectral full-rigged ship which is said to appear to sailors trying to round the Cape of Good Hope in a storm. In the story the ship is doomed never to enter port but to sail round the Cape forever, because of a vow sworn by its captain. Richard Wagner (*q.v.*) used this story as the basis for his opera "*Der Fliegende Holländer*," first produced in Dresden in 1843.

Flying Fish, any one of several kinds of tropical and semitropical bony fish with enlarged pectoral (*i.e.*, anterior paired) fins that enable them to glide through the air. The Catalina flying fish (*Cypselurus californicus*) was very thoroughly investigated by David Starr Jordan (*q.v.*), who found that the sole motive power of the fish is that of its tail under water. However, the tail may flip the surface two or three times before the fish falls back into the water. The common flying fish, *Exocoetus*, and the Australian flying fish, *Exonotus*, can cover about 100 ft. out of water, but the method is the same. The flying gurnard or bat fish of the tropics, *Dactylopterus volans*, presumably "flies" in a similar manner.

Flying Lemur (*lēm'r*), a nocturnal, plant-eating animal (genus *Galeopithecus*), about the size of a cat. It is provided with a fur-covered membrane stretching from neck to forelimbs, from forelimbs to hindlimbs, and thence to the tail. Flying lemurs hang upside down like bats, which they also resemble in the development of their teeth. However, unlike the bats, they do not have elongated fingers and cannot really fly but merely glide from tree to tree. They inhabit the Malay Archipelago. They are usually placed in an order (*Dermoptera*) by themselves, since they show relationships to bats, shrews, and primates.

Flying Squirrel. See *Squirrel*.

Flynn (*flin*), EDWARD JOSEPH, politician, born in New York City, Sept. 22, 1891; died in Dublin, Ireland, Aug. 17, 1953. He was educated at Fordham Univ. and was admitted to the bar in 1912. From 1918 to 1921 he held his first elective office

as assemblyman of Bronx County, N.Y. In 1933 he was appointed director of public works in the New York, New Jersey, and Pennsylvania area. In 1940-42 he was chairman of the Democratic National Committee.

Flywheel (*flī'whēl*), a heavy rotating wheel of a machine, used to prevent any fluctuation of speed. By its revolution and its inertia it resists sudden accelerations of speed, and by its momentum it prevents sudden retardation. Thus it serves as a store of energy and also carries the engine over the dead centers.

Foch (*fōsh*), FERDINAND, military leader, born in Tarbes, France, Oct. 2, 1851; died in Paris, March 20, 1929. Commissioned in 1873, he served on the general staff and was appointed (1894) professor of military science. At the outbreak of World War I he commanded an army corps at Nancy and took part in the first battle of the Marne (September 1914). In 1916 he directed the battle of the Somme and, after a brief eclipse,



FERDINAND FOCH

was appointed (May 1918) commander in chief of the French, British, and American armies. Named a marshal of France (Aug. 1918), he directed the final Allied offensive and received the German surrender (Nov. 11, 1918). In 1919 he was elected to the French Academy. In the postwar period Foch urged permanent occupation of the Rhineland.

Focus (*fō'cūs*), in physics, a point at which a number of rays of light come together. When light rays go through a lens or a curved mirror, those coming from one point are brought together again at one point, called the focus. If the light rays are parallel, that is, if they come from a point very far away, they come together at a principal focus (see diagram under *Mirror*). As the source of light rays moves nearer the mirror, they are brought to a focus at a point further

from the mirror than the principal focus. See also *Photography*.

Fog (*fōg*), a cloud at or near the earth's surface, resulting whenever the temperature of the air is reduced to the dew point, thereby condensing the atmospheric water vapor into a multitude of minute water droplets or ice crystals. These water particles, which interfere to varying degrees with the horizontal visibility at the surface, are so small that they are wafted about by even the lightest winds. Off the banks of Newfoundland the warm, moist air of the Gulf Stream is cooled by the cold air of the Labrador ocean current, hence frequent and almost constant fogs arise. Ground fog, which is common over land, forms when moist surface air is strongly cooled by radiative loss of heat, especially on clear, calm nights. See also *Chemical Warfare*; *Smoke*.

Fogazzaro (*fō-gāt-tsā'rō*), ANTONIO, novelist and poet, born in Vicenza, Italy, March 25, 1842; died near there, March 7, 1911. He studied law, but never practiced. His first work, "Miranda," a poem, was published in 1874, and his first novel, "Malombra," in 1881. His other fictional works include "Daniele Cortis" (1885), "Piccolo Mondo Antico" (1896; translated into English as "The Patriot"), and "Leila" (1911). In his writings he attempted to reconcile traditional Christian belief with the revelations of modern science.

Fog Signals (*fōg sīg'nālz*), communication by sound during foggy weather to warn ships against collision or running into danger. Bell buoys and whistle buoys, operated by the action of the waves, are anchored above reefs, rocks, or along ships' channels to guide navigation during fogs or at night, if the buoy is unlighted. A code of whistle signals is followed by ships during fogs. Each ship is required to blow the fog-horn whistle at regular intervals as a warning to other ships. The use of radar (*q.v.*), racon, and loran (*q.v.*) provide modern, efficient means of safeguarding navigation during fogs or at night.

Foil (*foil*), from the Latin *folium*, meaning leaf. In *architectural decoration* a term designating the leaflike spaces which are formed by the cusps (the curved projections) of Gothic tracery. In *metallurgy*, thin tissue-like sheets of metal such as gold, silver, tin, and aluminum, prepared by rolling or beating the metal (see *Gold Leaf*). In *fencing*, a light, swordlike weapon having a button at the end to prevent injuries.

Fokine (*fō-kēn'*), MICHEL, choreographer, born in St. Petersburg, Russia, April 26, 1880; died in New York City, Aug. 22, 1942. From 1909 to 1914 he directed the ballet company of Sergei Diaghilev (*q.v.*), discarding many of the traditions of classical choreography and inaugurating the modern style of emotional movement.

For his work in this field he is regarded as the founder of modern ballet. In 1925 he came to the U.S., where he directed his own ballet company, becoming a U.S. citizen in 1932. His best-known choreographical works include "*Les Sylphides*" (1908), "*Schéhérazade*" (1910), "*L'Oiseau de Feu*" (1910), "*Petrouchka*" (1911), and "*Spectre de la Rose*" (1911).

Fokker (fōk'ēr), ANTHONY HERMAN GERARD, aircraft designer, born of Dutch parents in Kediri, Java, April 6, 1890; died in New York City, Dec. 23, 1939. After preliminary schooling in Haarlem, The Netherlands, he studied aviation in Germany. During World War I he manufactured combat planes for Germany and perfected a device which synchronized machine-gun fire with propeller revolutions. In 1922 he came to the U.S., where he was later naturalized, and founded the Fokker Aircraft Corp. of America. He greatly extended the use of metal in the construction of aircraft fuselages. See also *Aviation*.

Fold (fōld), a flexure or bend in the layered or stratified rocks which occur in the outer crust of the earth. Folds result from stresses or forces acting on the earth's outer layers. Warping or folding of the strata may be so gentle that it is perceptible only by accurate measurement of the amount the strata deviates from a horizontal plane. Some rock layers are strongly folded over short distances and may be observed readily. Folds which have been bent downward (U-shaped) are called synclines, and upbowed folds are called anticlines. Extreme deformation may overturn a fold. An upwarp that is roughly symmetrical and in which the beds dip in all directions from a central point is called a dome. A basin is a downward warped structure in which the strata dip toward the center from all sides.

Foley (fō'li), JOHN HENRY, sculptor, born in Dublin, Ireland, May 24, 1818; died near London, England, Aug. 27, 1874. He studied at the Dublin Society of Art and at the Royal Acad. in London. In 1839 he exhibited "The Death of Abel," and the following year his "Ino and Bacchus." Among his larger works is a colossal statue of Prince Albert. In 1858 he was made a member of the Royal Acad. Among his later productions are "Youth at a Stream" and "Death of King Lear."

Folger (fōl'gēr), CHARLES JAMES, jurist and statesman, born in Nantucket, Mass., April 16, 1818; died in Geneva, N.Y., Sept. 4, 1884. After studying law, he was admitted to the bar of New York in 1839. He was a state senator from 1861 to 1869 and in the latter year was appointed Assistant Treasurer of the U.S. in New York by President Grant. In 1871 he was elected to the state court of appeals and later was chief justice of New York.

Folger, HENRY CLAY, oil executive and bibliophile, born in New York City, June 18, 1857; died

in Brooklyn, N.Y., June 11, 1930. He was graduated from Amherst Coll. in 1879 and received a law degree from Columbia Univ. in 1881. Starting as an oil refinery clerk, he became president (1911-23) and chairman of the board (1923-28) of the Standard Oil Co. of New York. He is best known for his building and endowment of the Folger Shakespeare Library, in Washington, D.C. Its Tudor interior houses a reproduction of an Elizabethan theater, an exhibition hall, and the 70,000-volume library, containing many of the rarest Shakespearean quartos and folios.

Folk Art (fōk ārt), a comprehensive term for works of art, especially of applied art, not executed by an individual artist but originating within an anonymous ethnic group, as documented in pottery, basket work, textiles, wood carving, etc. The simpler forms of architecture such as village houses or small churches may be called folk art. Works of different nations or even of provinces or regions within a nation are characterized by certain typical patterns or motifs.

Folk Dance. See *Dancing*.

Folklore (fōk'lōr), a term used to signify not only the body of popular beliefs, customs, tales, and other oral traditions, but also their scientific study. The study of folklore recorded from the lips of the "folk" and compared with other versions began with the Grimm brothers, whose first collection of tales was published in 1812. The study of folklore has since received considerable stimulus from, and in turn has enriched, researches in ethnology, primitive religion, sociology, psychology, history, mythology, and popular literature.

In addition to its intrinsic interest as an expression of popular fantasy, folklore throws light on the origin and diffusion of traditional ideas and forms, both primitive and civilized, and their international character.

The American Folklore Society, founded in 1888, at Cambridge, Mass., was primarily formed to encourage the collection and publication of folklore in the Americas. The work has been furthered by American universities and scholars which has resulted not only in extensive publication, but also in the formation of important archives and collections in libraries such as the Library of Congress.

Folk Music (fōk mŭ'zīk), the body of anonymous musical composition of a country or region, to be distinguished from art music, which is the work of trained individual composers. Folk music is transmitted orally and consists chiefly of songs dealing with everyday activities. Songs of work, love, war, and patriotism, cradle songs, and drinking songs may be examples of folk music. As the vehicle by which a ballad is sung or a dance is performed, folk music is limited to the structure of the ballad stanza or the dance

figure and must rely on its melodic qualities to keep it from becoming tedious despite frequent repetition. Similarities between folk songs of widely separated communities may indicate a common ancestry and the age of the songs. Most European folk songs date from the 17th and 18th centuries, and many of them show clearly the influence of art music. In the U.S., songs of the Negro, sea chanties, and work songs—as sung by canal boatmen, railroad men, lumbermen, cowboys, and others—represent a type of folk music.

Folk Psychology (*sŷ-kōl'ō-gŷ*), a branch of psychology which deals with the mental development and social behavior of primitive tribes. The methods of research are mainly comparative, the roots of language, the religious beliefs, and the individual customs being studied and compared with later stages of human development.

Folsom (*fōl'sūm*), MARION BAYARD, Secretary of Health, Education, and Welfare, born in McRae, Ga., Nov. 23, 1893. A graduate of the Univ. of Georgia and the Harvard Business School, Folsom had spent his business career with the Eastman Kodak Co. until he was named to a U.S. Treasury post (1953). As an Eastman executive, he initiated (1928) one of the first industrial (private) social-security programs; during the depression he developed the "Rochester Plan," a widely copied unemployment plan, cooperative among several firms. In 1934 he was named to the advisory unit which wrote the first Federal Social Security Act. Folsom served as Secretary of Health, Education, and Welfare in 1955-58, succeeding Oveta Culp Hobby (*q.v.*). He resigned from the post in 1958 and returned to the Eastman Kodak Co.

Folsom Culture (*fōl'sūm kŭl'tchūr*), one of the most ancient epochs of North America. It was named for the town of Folsom, N.M., near which the first remains (arrow or dart points near the ribs of fossil bison) were discovered in 1926. In 1928 more points were found, along with the skeletons of 23 bison, complete except for the tail bones. This is considered evidence that the animals had been skinned by hunters, the tails having been removed with the hides.

Since then, the association of Folsom artifacts with Pleistocene mammals has been found at four different localities: near Clovis, N.M.; at Lindenmeier, Colo.; near Lipscomb, Texas; and perhaps also at Lingert, Colo. Geological evidence at Lindenmeier suggests that Folsom Man inhabited North America perhaps as early as 25,000 years ago, although radiocarbon dating at one site suggests an antiquity of only 10,000 years.

There are distinctive differences between the Folsom tools and those of other early American Indians. The Folsom projectile points are finely flaked tips of either spears or darts and are of characteristic shape. The pressure-flaking technique used required extraordinary skill, and

there is seemingly no correspondence between the Folsom Culture and that of any other contemporary Old World culture. Points similar to the Folsom type have been discovered in many parts of the U.S., particularly Ohio, but their age and associations are not known. This suggests that Folsom hunters had wandered over much of the country in the late Ice Age.

Until recently no fossil bone of Folsom Man himself had come to light, but a rib discovered (1953) at Blackwater Draw, N.M., might prove the first bone of Folsom Man to be found.

Fond du Lac (*fōn'dā lāk*), a city in eastern Wisconsin, seat of Fond du Lac County, on Lake Winnebago, ca. 60 m. N.W. of Milwaukee. It is served by the Chicago & North Western and other railroads and linked with the Great Lakes by the Fox River. In a farming and dairying region, it manufactures precision tools, leather, textiles, refrigerators, automotive parts, and wood and metal products. The site of St. Paul's Protestant Episcopal Cathedral, Fond du Lac was settled in 1836 and incorporated in 1852. Population, 1950, 29,936; in 1960, 32,719.

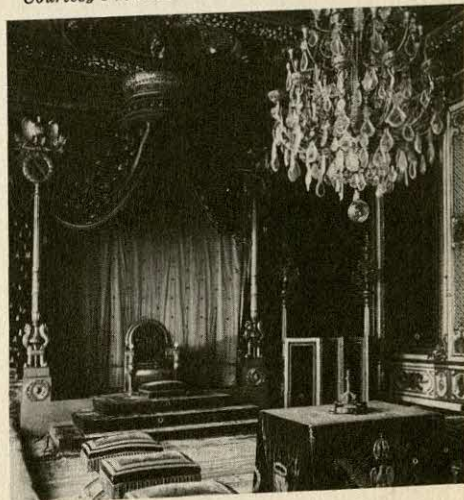
Fontaine (*fōn-tēn'*), PIERRE FRANÇOIS LÉONARD, architect, born near Paris, France, Sept. 20, 1762; died there, Oct. 10, 1853. During the French Revolution he fled to England, but later he was employed by Napoleon I to restore the palace at Malmaison. As court architect after the Restoration, he designed such Paris landmarks as the Rue de Rivoli, the Arch of the Carrousel, and the Grand Staircase of the Louvre. He wrote many books on architecture.

Fontainebleau (*fōn'tēn-blō*), a town in the department of Seine-et-Marne, France, near the

PALACE OF FONTAINEBLEAU

Throne Room of Napoleon I

Courtesy French Press & Information Service, N. Y.



Seine River, about 37 m. s.e. of Paris. A clean, quiet place with broad streets, it owes its fame chiefly to the palace of the kings. This is one of the most beautiful chateaus in France. It was founded by Robert the Good in the 10th century and was greatly improved by many succeeding rulers. The forest, or park, in which it is situated is a magnificent expanse of woods containing fountains, statues, flowers, and artificial lakes. Napoleon detained Pope Pius VII as prisoner at Fontainebleau for two years. He signed his abdication here in 1814 and again in 1815. The town manufactures porcelain and wines, and, owing to its extensive pleasure grounds, ranks as a favorite resort for visitors. Population, ca. 15,000.

Fontanne (*fōn-tān'*) LYNN, actress, born in London, England, Dec. 6, 1887(?). She studied with Dame Ellen Terry (*q.v.*) and appeared as a



Photo by Vandamm Studio, N. Y.

LYNN FONTANNE AND ALFRED LUNT

In "O Mistress Mine"

child actress with the Drury Lane Pantomime in London. She came to the U.S. for the first time in 1910 but did not achieve stardom until her success as *Dulcinea* in "Dulcy," by George S. Kaufman and Marc Connelly, in 1921. In 1922 she and Alfred Lunt (*q.v.*) were married, and in 1924 they starred together for the first time in "The Guardsman," by Ferenc Molnár. Since then they have always appeared together, with the exception of the year 1928. In that year, she appeared in "Strange Interlude" by Eugene O'Neill, and he appeared in "Marco Millions," also by O'Neill. In 1956 they appeared on Broadway in "The Great Sebastians," by Howard Lindsay and Russel Crouse, and later repeated it for their only television appearance.

Fontenoy (*fón-tē-nwā'*), a village in the province of Hainut, Belgium, 5 m. s.e. of Tournai. It is celebrated on account of a battle, on May 11, 1745, between the allied forces of Austrians, Dutch, and British and the army of France, each side numbering about 60,000 men. The French were commanded by Marshal Saxe and the allies by the Duke of Cumberland. The result was a forced retreat of the allies with a loss of 7,000 on each side.

Fonvielle (*fón-vyēl'*), WILFRID DE, aeronaut and author, born in Paris, France, July 26, 1828; died in 1914. He became a teacher at an early age, but shortly after engaged in journalism and edited *Algérie Nouvelle*, which was suppressed by the government because of its revolutionary tendency. In 1858 he made a number of ascents in a balloon and became distinguished as an aeronaut, and in 1870 escaped from Paris in a balloon while that city was besieged. Subsequently he made ascents for the purpose of studying meteorology. As a journalist and lecturer he favored the republican form of government. His publications include: "Fossil Man," "Thunder and Lightning," "Wonders of the Invisible World," and "How Republics Perish."

Foochow (*fōō-chow'*), capital of the province of Fukien, China, situated on the Min River, 25 m. from its mouth. Massive walls surround the city, while its streets and buildings show more than the ordinary Asiatic progress. By the treaty of Nanking (1842), it was thrown open to foreign trade and is one of the most important tea-markets and missions in China. Cotton goods, opium, machinery, and lead are the chief imports, and paper, porcelain, silk and cotton fabrics are manufactured. The city has extensive modern drydocks and wharves. Population, ca. 325,000.

Food (*fōōd*). See *Agriculture*: FOOD AND NUTRITION; *Nutrition*.

Food and Drug Administration, a Federal agency within the Dept. of Health, Education, and Welfare. It enforces U.S. laws (*viz.*, Food, Drug, and Cosmetic Act of 1938 and others) to promote the purity, standard potency, and truthful and informative labeling of foods, drugs, cosmetics, and therapeutic devices. The F.D.A. inspects factories and warehouses, checks the composition and labeling of products, formulates food standards, passes on the safety of new drugs and pesticidal residues, and tests and certifies insulin, certain antibiotics, and coal-tar colors for use in foods, drugs, and cosmetics before they may be distributed.

Fools (*fōōlz*), **FEAST OF**, a festival celebrated for several centuries in a number of countries of Europe, especially in France and Spain. It was a season of Christian merrymaking and partook of a childish character. The festival was celebrated more or less during the entire period between

Christmas and Epiphany (Jan. 6), but belonged especially to Innocents' Day (Dec. 28). It resembled the Roman Saturnalia, with the chief participants including the subdeacons and laity. In the exercises they chose a mock bishop, archbishop, or pope, who presided at the meeting in the church, and the rites of Christianity were reviewed in the ceremonies. Dancing, the singing of popular songs, and the wearing of masks and disguises were practiced. The Protestant Reformation counteracted the extravagances of these festivals and put an end to them in Germany and England, but they survived in France until 1644.

Foot (*fōt*), a unit of linear measurement, containing 12 inches. A four-sided surface, each side of which is 12 in., is a square foot, and is equal to 144 sq. in. A cube whose sides are 12 in. is a cubic foot, and contains 1,728 cu. in. The foot unit was derived from the human foot. It is used extensively as a common measure, although its length varies in different countries.

In music and poetry, a foot is a term used to denote a melodic figure of notes with only one accent, or a succession of accented or unaccented syllables, which, being repeated, produce rhythm. The four principal feet in English poetry are the anapest, the dactyl, the iambus, and the trochee.

Foot, the extremity of the leg below the ankle, and on which the body is supported. In man the foot is composed of seven tarsal and five metatarsal bones, so arranged and connected as to form an arch from the extremity of the heel to the ball of the toe and the phalanges. At points where the bones articulate with one another they are covered with a considerable layer of elastic cartilage. Between the bone at the heel and the ends of the metatarsal bones is a heavy ligament known as the *plantar ligament*, which not only holds the bones together in the form of an arch, but protects the blood vessels, nerves, and muscles that lie above it in the hollow of the foot. Another very strong, elastic ligament holds the heel bone and the central bone of the arch together. The head of the key bone, upon which the tibia sits, rests upon this ligament. The different motions of the foot are effected by five muscles. They include the *calc*, attached to the thigh and leg, and to the heel bone below by the tendon of Achilles, which is the largest tendon in the body and sustains its weight in walking; the *posterior tibial*, attached at one end to the tibia and the other to the instep bone (scaphoid); the *short fibular*, attached to the fibula at one end and to the outer metatarsal bone at the other; the *anterior tibial* which raises the toes and turns the foot outward; and the *third fibular*, whose tendons pass in front of the ankle on either side of the foot and raise the inner or outer border of the foot. The bottom of the foot is padded with fat and covered with a strong, tough skin, called the *sole* of the foot.

Foot and Mouth Disease (*fōt ānd mōuth dī-zēz*), an infectious disease common to domestic animals, especially swine and cattle. It occurs most frequently in Europe and Asia, but sometimes spreads to Africa and other continents. During a widespread attack of the contagion, it may affect sheep, goats, and man as well, being conveyed to the last-mentioned by milk or meat from diseased animals. It is often fatal to young animals, in adults assuming a lighter form—usually as a fever or constitutional weakness. Bacteria causing the disease are not well understood, but it is known that the period of incubation is from three to six days, and that the virus may be destroyed by exposure to sunlight or antiseptics, such as formaldehyde and carbolic acid. Animals affected have symptoms similar to those seen in pneumonia and bronchitis, and their feet, mouth, and other parts are subject to eruptions from which virus exudes. The treatment recommended is quarantining the sick animals and treating the affected parts with antiseptic solutions. See *Hoof and Mouth Disease*.

Football (*fōt'bal*), a popular outdoor game played with an inflated ball by two opposing teams on a lined field. It is an ancient game, having been popular during the prosperous eras of ancient Greece and Rome. The northern countries of continental Europe adopted it about the time of the Roman invasions, while the Danes introduced it in England, where as early as the 12th century it became famous as a Shrove Tuesday sport. There are many allusions to the sport in English literature, from Chaucer to Shakespeare. Although popular for centuries, it has taken a wider hold on the world of sport within recent decades and is played with an ever-increasing frequency. Among the numerous and widely known associations are those called the Rugby Association, the Gaelic Association, and the American Intercollegiate Association. Each of these and many others have definite rules, under which the members practice, and at specified times engage in competitive games with other associations. The associations organized at the three universities of Harvard, Princeton, and Yale where the game made its appearance in the early 1870's, have been known as the *Big Three*, while similar association ties have been accorded to the Canadian, Central Western, Rocky Mountain, and other groups of organizations.

The American intercollegiate game is played by two contesting teams, each having 11 players, upon a level field, 160 ft. wide and 360 ft. long, divided by white lines into 5-yd. intervals, and having two end zones; the whole is known as a "gridiron," from its appearance. A team is divided into linemen and backs. The seven forwards, who are the rush line, are left- and right-end, left- and right-tackle, left- and right-guard, and center.



FOOTBALL. AN INTERCEPTED PASS

Such a moment, when the ball is lost to the opponents by a touch of the hand, can easily be one of the most dramatic in football.

The backfield consists of a quarterback, two halfbacks, and a fullback. Scoring is possible in the field of the opposing side, either by getting the ball through or over a goal, or by passing it over a certain line. Goal posts, set up at each end of the field, are 20 ft. high, 18½ ft. apart, with a crossbar, over which the ball must pass in order to score, 10 ft. from the ground. Each side, therefore, with the view of scoring, sends the ball in the direction of the opponent's end of the field. This may be done in several ways—by kicking, carrying, or passing the ball. The ball is made of leather, having a large ellipsoidal form.

Among the officials are a referee, an umpire, a head linesman, and a field judge. The *referee* has general oversight and control of the game. He is sole authority for the score, and sole judge of forfeiture of the game under the rules. His decision on such matters is final. The *umpire* has jurisdiction over the equipment, conduct, and positions of the players, and also assists the referee with decisions. The *head linesman* marks the progress of the ball and assists the umpire in decisions over ineligible players. The *field judge* has charge of timing the game. In most associations the time of the game is 60 minutes, divided into four quarters of 15 minutes, with intermissions of one minute after the first and third and 15 minutes after the second. The game goes to the team with the highest point score. A touchdown, scoring six points, is made when a player carries or receives a ball across his opponent's goal line, after which an additional point may be won by a successful kick (kick out of play) between the goal posts and above the cross bar. A field goal by either a drop kick (kick in play) or a place kick scores three points; such goals may be scored in regular play or through a free kick

FOOTBALL

awarded by the referee, during which the opposing team is not in play. A safety goal counting two points is scored by one team when a member of the opposing team possessing the ball is forced to touch ground behind his own goal line, provided a player of his team caused the ball to pass the goal line.

ASSOCIATION FOOTBALL OR SOCCER: The game is played upon a field 100 to 130 yds. long by 50 to 100 yds. wide, marked with goal-lines at the ends, touch-lines at the sides, a halfway line, a goal area, and a penalty radius. The spherical ball is between 27 and 28 in. in circumference. Goalposts, set in the middle of the goal line, are 8 yds. apart, with a crossbar 8 ft. from the ground. The ball must pass underneath the crossbar between the posts in order to score, and each goal scored counts one point. The 11 players of the team have the following designations: five forwards, known as outside left, inside left, center, inside right, and outside right, who deploy at equal intervals along the halfway line; a goalkeeper standing on or near the goal line, and two lines of backs, at equal distances between the halfway line and the goal line, consisting of three halfbacks and two fullbacks, arranged upon their respective lines at equal distances from one another. The players maintain their relative positions throughout the game, but the distances between them vary while the ball is in play. Before beginning, the two captains toss a coin; the winner chooses between goal play and kickoff. The game, lasting 90 minutes, has two halves of 45 minutes each, with an intermission between halves of one minute, at which time the opposing teams each switch goals.

A place kick from the center field line starts the game. The players kick the ball toward their opponents' goal area; the goalkeeper alone, within his penalty radius and for not more than two steps, may handle the ball, or block the ball from entering the goal by using any part of his body. A player nurses the ball ahead of him by "dribbling" it with short kicks. If a ball is forced past the touch lines by one team player, a member of the opposite team throws it into the field again, where it resumes play. If the ball is kicked across the opponent's goal line, it is kicked back into play by a player of the opposite team from within his opponent's goal area. If a player kicks the ball across his own goal line, one of his opponents kicks it back into play with a "corner kick" from a point within 1 yd. of the nearest corner, but such a kick may not directly score a goal. Players are not allowed to trip one another, or hold or push an opponent with their hands. They may use their bodies for blocking, but may not charge opponents from behind unless intentionally blocked by them.

GAELIC FOOTBALL: Revived in recent years from the old Irish form, played commonly by 15

players, and characterized by outer-point goal posts which increase opportunities for scoring. The players form parallel lines, holding hands. The ball is thrown into play between the lines, and is kicked or struck by the hands, but not thrown or carried. A player may "hop" or "dribble" the ball by bouncing it between his hand and the ground while advancing down the field.

RUGBY FOOTBALL: Rugby, the specifically British form of football, is played upon a field no more than 110 yds. long by 75 yds. wide, marked with goal lines, touch lines, 5- and 25-yd. lines, a half-way line, and dead-ball lines. The goal posts are 11 ft. high, 18½ ft. apart, with a crossbar 10 ft. high. The ball is oval. Fifteen players make up a side, including eight forwards, two halfbacks, four three-quarterbacks, and one fullback. A game usually lasts 80 minutes, with two 40-minute halves.

A placed kickoff from center field starts the game. Henceforth, the ball is put in play by a "scrummage," which resembles from outside the "huddle" of the American intercollegiate game, but involves the 16 forwards of both teams, who pack closely together. A "scrum" halfback, after rolling the ball into the scrummage, runs behind it to receive the ball from the forwards, who "heel" it out to him. The half then runs with the ball, attempting to score a try by touching the ball down behind the opponent's goal line, and as a result involving the three-quarterbacks in a concerted passing movement. A try counts three points and permits the scoring side a free kick from the field, which, if successfully aimed between the posts and over the bar, counts five as a "goal from a try," and supersedes the try score. A "dropped goal," or a between-posts goal from play by a drop kick, counts four points. A "goal from a mark" from a free kick following a fair catch of the ball from an opponent's kick or throw, counts three points. A "goal from a penalty kick" likewise counts three points. See also *Soccer*.

Foote (*fōt*), ANDREW HULL, naval officer, born in New Haven, Conn., Sept. 12, 1806; died in New York City, June 26, 1863. In 1822 he entered the navy as midshipman, and became a captain in 1849. When the Civil War began, he was given command of the western flotilla. His expedition resulted in the capture of Fts. Henry and Donelson and Island No. 10, for which he was made rear admiral (1862). Wounded at Ft. Donelson, he was later given charge of the Bureau of Equipment and Recruiting. In 1863 he was assigned to the fleet off Charleston, but died before he could assume the command.

Foote, ARTHUR, composer, born in Salem, Mass., March 5, 1853; died in Boston, April 9, 1937. He was graduated as a student of music from Harvard Univ. (1874). Later he studied piano and organ, playing with B. J. Lang, and

was organist of the First Unitarian Church in Boston (1878-1910). He was known not only for his church music but also for his secular orchestral and vocal works, such as "In the Mountains," "The Skeleton in Armor," "The Wreck of the Hesperus," and "The Farewell of Hiawatha." He composed about 100 songs, including "On the Way to Kew," "Irish Folk Song," "O Swallow, Swallow," and "I'm Wearin' Awa'."

Foot Rot (*fōt rōt*), a disease common among sheep. The most prevalent form is due to an unusual growth of hoof, which causes the margin or toe to turn downward and ultimately crack, producing openings in which dirt and sand readily lodge. As a consequence the feet swell and ultimately become ulcerated between the toes, where proud flesh forms and causes decay.

Forage (*fōr'ij*), a term used to designate any food suitable for horses, cattle, and sheep, including hay, straw, and ensilage. Among the forage plants cultivated extensively are clover, orchard grass, alfalfa, timothy, corn, broom corn, and sorghum. The straw and chaff of many cereals, such as wheat and oats, are also important animal fodder. The species of plants cultivated for forage depend upon temperature and aridity quite as much as upon the different kinds of soil. In many portions of the West native grasses still constitute an important forage crop, while in the East and the arid regions of the Far West forage plants are grown with a high degree of care. In the West and Southwest, where moisture is supplied by irrigation, the larger forage plants, such as alfalfa, sorghum, and millet, are widely cultivated.

Foraker (*fōr'ā-kēr*), JOSEPH BENSON, U.S. Senator, born near Rainsboro, Ohio, July 5, 1846; died in Cincinnati, May 10, 1917. A farm boy, he entered the Union Army in 1861, serving until the end of the war. He attained the rank of captain, and was an aide to Gen. Slocum when mustered out. He then entered Ohio Wesleyan Univ.; in 1869 he was graduated from Cornell and admitted to the bar of Ohio. He became governor of Ohio (1885-89), and served in the U.S. Senate (1896-1909). As a supporter of the policies of Mark Hanna and William McKinley (*qq.v.*), he was noted for his numerous controversies with President Theodore Roosevelt.

Foraminifera (*fō-rām-i-nī'ēr-ā*), a group of small animals, classed with the mollusks on account of having beautiful shells. A few of the species are naked, but many have very complicated and remarkable coverings. They belong to the protozoan group and, like them, reproduce in all three ways common to that form of life. The species are widely distributed, but are most common in salt water. Fossils of these animals are very numerous, and vast beds of rock are constructed almost entirely of their shells. The

chalk cliffs of England and the Silurian beds of Russia are examples of fossils of these animals.

Forbes (fórbz), ARCHIBALD, war correspondent, born in Morayshire, Scotland, in 1838; died in London, March 30, 1900. After studying at Aberdeen Univ. he served briefly in the Royal Dragoons. In the Franco-Prussian War of 1870-71 he was correspondent for the London *Daily News*, and later reported many other news events, including the Russo-Turkish War and the South African campaign of 1879. Among his many publications, perhaps that of most general interest today is the semi-autobiographical "Memories and Studies of War and Peace."

Forbes, SIR JOHN, physician, born in Banffshire, Scotland, Oct. 18, 1787; died at Whitchurch, England, Nov. 13, 1861. He studied at Marischal Coll. and became an assistant surgeon in the navy, and in 1817 took a degree at Edinburgh. Subsequently he practiced medicine in Chichester and London, and became physician to Prince Albert and later to Queen Victoria. He was knighted in 1853. Besides being noted as a physician, he was a phrenologist and a believer in mesmerism.

Forbes, STANHOPE ALEXANDER, artist, born in Dublin, Ireland, Nov. 18, 1857; died March 2, 1947. He studied art at the Royal Acad. schools, and in Paris under Bonnat. A genre painter, he early won acclaim in France, and later received many honors throughout Europe, including membership in the Royal Acad. at London (1910). Best known of his works are "The Fire of London" in the London Stock Exchange; "Off to the Fishing Ground," "The Health of the Bride," "The Lighthouse," "By Order of the Court," and "The Fish Sale." His first wife, Elizabeth Adela Armstrong Forbes (died 1912), was also an artist of merit.

Forbes-Robertson (ră'bért-sŭn), SIR JOHN-STON, actor, born in London, England, Jan. 16, 1853; died near Dover, Nov. 6, 1937. In his youth he studied art, but abandoned that for the stage in 1874. After 21 years of stage appearances with such celebrities as Mrs. Patrick Campbell, Sir Henry Irving, etc., he produced his own "Romeo and Juliet" in London; this was followed by successful presentations of "Othello" and "Hamlet." He first appeared in the U.S. in 1885, presented Shaw's "Caesar and Cleopatra" here in 1906, and revisited the U.S. (1913-14) with his wife, Gertrude Elliot. On his retirement from the London stage (1913), he was knighted. A daughter, Jean, became an actress, and another daughter, Diana, married the American writer, Vincent Sheean (q.v.).

Force (fórs), in physics, the exertion or influence that acts to stop a body in motion or to move it when at rest, or to change its rate of momentum. In the metric system, the unit of force is the *dyne*, which represents that force which when

acting on a mass of one gram will move it (or decrease its rate of movement) by one centimeter per second for each second it acts. A new metric unit of force, recently adopted by some physicists, is the *newton*, which represents that force which will move (or decrease its rate of movement) a mass of one kilogram one meter per second for each second it acts. In the English system, the unit of force is the *poundal*, which represents that force which will move a weight of one pound a distance of one foot (or decrease its rate of movement by that much). The poundal is equal to 13825.5 dynes.

Newton's laws of motion show that 1) bodies continue in a state of rest or uniform motion unless that condition is changed by applied force; 2) the rate of change of momentum is proportional to the acting force, and is in the direction in which the force acts; 3) whenever force is applied to a body, there is an equal and opposite reaction. From number 2) above, it is obvious that force is, mathematically, a vector quantity, because it involves both magnitude and direction. Weight is a form of force, for the weight of a body is the amount of force which attracts it toward the earth. The formula for this force of

gravity, or weight of an object, is $F = G \frac{M M'}{d^2}$

where F equals the force of gravity or weight, M is the mass of earth, M' is the mass of the body, and d² is the distance between the body and the center of the earth. G is a constant which depends upon the units used. Coulomb, a French physicist, studied electric forces and found that the force between two electrical charges varies inversely with the square of the distance between them; and varies directly with the product of their

electrical charges. The formula is $F = K \frac{Q Q'}{d^2}$

where F is the electrical force, Q and Q' are the two charges, and d² is the square of the distance between them. K is a constant depending on the units used. Consistent with number 3) above, there is a force on a wire carrying a current across a magnetic field, and this force is perpendicular both to the current and to the magnetic field. This force is proportional to the current multiplied by the strength of the magnetic field and multiplied by the length of the wire. The force between two magnetic poles is directly proportional to the magnitude of each pole, and inversely proportional to the square of the distance between them. The unit-pole, or electrostatic unit of charge, is that amount of charge, which, when placed in a vacuum at a distance of one centimeter from a similar pole, will be repelled with the force of one dyne.

Mechanical force is closely related to work performed, for the product of the force and the distance the object is moved in the direction of the

force equals the amount of work performed. When two forces are acting upon a body in the same direction, the resulting force is the sum of these two forces. If two equal forces act in opposite directions, in opposition to each other, the body remains at rest and the forces are said to be in equilibrium. The force exerted in a direction outward from the center by a body moving in a circular path is called centrifugal force; while centripetal force is exerted from outside toward the center. The mechanical advantages of machines consist in causing a relatively small applied force to overcome a large force of resistance, and a machine is a device to change the magnitude and direction of a force. The principle of the lever, the pulley, and the inclined plane illustrates the mechanical advantages of such devices. The term "electronic force" is sometimes used to refer to the binding force of electrons in atoms. Atomic forces are those which bind atoms into molecules, and molecular forces those which bind molecules together. Chemical forces refer to the selective affinity of elements for each other. Electromotive force, E.M.F., is used to refer to electrical pressure, voltage; *i.e.*, the driving force behind the electrons comprising a current.

Force Bill, a name applied to several bills passed by the U.S. Congress. Objecting to a tariff act of 1828, South Carolina claimed that the state had power to nullify objectionable Federal enactments. The bill passed by Congress in 1833 to enforce the tariff law became known as the Force Bill, or the Bloody Bill. A bill for the enforcement of the Fourteenth and Fifteenth Amendments to the Constitution became law May 31, 1870. It made punishable by fine or imprisonment all attempts at intimidation, bribery, or hindrance in the matters of registration and qualifying for voting. A stringent law was enacted in 1871 to put down conspiracies against civil rights by the Ku Klux Klan.

Forceps (*fôr'sēps*), pincers for grasping bodies impracticable to hold with the fingers. Used by dentists in extracting teeth, by watchmakers to reach the minute parts of a watch, by surgeons to remove foreign substances or compress arteries, etc., there are many types of forceps for various purposes.

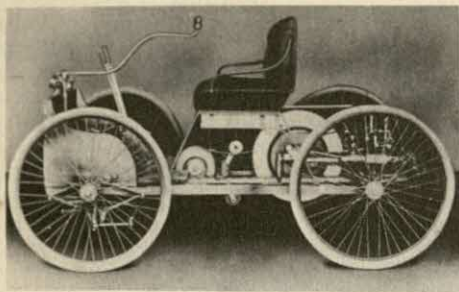
Ford (*fôrd*), EDESEL, industrialist, only son of Henry Ford (*q.v.*), born in Bagley, Mich., Nov. 6, 1893; died May 25, 1943. He started at the bottom in his father's Ford Motor Co., studying various stages of the business. By 1918 he was a vice president, and in 1919 became president when his father resigned that post. He was responsible for the change from the "Model T" to the "Model A" Fords, and the development of a relatively cheap car which could compete in style with higher-priced cars. In World War II, Ford applied mass-production methods to airplane

production, and his plants turned out bombers on a scale previously considered impossible.

Ford, HENRY, automobile manufacturer, born in Greenfield, Mich., July 30, 1863; died April 7, 1947. A farmer's son, he began his career as a machinist and early began experimenting with mechanical transport. His first motorcar he built by hand in 1892. Advertised by the exploits of the famous racing driver Barney Oldfield, Ford cars were well known by 1908. In that year, Ford standardized production of a single model for mass distribution, to sell at a mass-market price (once as low as \$310), and thus revolutionized the automobile industry. By 1927, when increased incomes, changing taste, and better highways forced Ford to change models, the famous "Model T" had been reproduced over 15,000,000 times; and by 1942, when the factories shifted to war production, more than 30,000,000 Ford cars had been sold.

Besides proving the consumer-savings and producer-profits of mass production on assembly lines, Ford influenced the American economy in another way. In January 1914 he announced a startling new wage policy, raising pay from an average of \$2.40 for a nine-hour day to a flat \$5 for an eight-hour day. While to many this appeared to be a move to better the lot of the worker, it was a change of policy necessitated by the monotony of assembly-line technique, the sinking status of the individual employee, and the resultant tremendous employee turnover (380 per cent in 1913, for example). In actual practice, the "Five-Dollar Day," as it came to be called, did not automatically encompass all Ford workers; in order to qualify for the bonus provisions bringing a day's pay to the \$5 mark, workers had to exhibit a prescribed level of conduct in their private lives. To check on such matters, the company established a special department which visited employee homes and gave advice on morals and household management; while some held that this was a form of "snooping," others maintained that these visits were in the nature of social welfare work and also tended to "Americanize" foreign workers and their families. Nevertheless, the announced policy gave Ford a reputation allowing him the pick of labor and provided him with priceless publicity; consequences in American industry have since been far-reaching. The Ford wage policy did not, however, adequately offset the tension of assembly-line work, and, partly as a direct result of Ford's lifelong distaste for labor unions, his plants were besieged by labor troubles until he finally signed a union contract in 1941.

A man of simple ideas—often oversimplified, as in his hatred of government interference and "Wall Street" influence, and in his anti-Semitism—he was a sincere pacifist, and in 1915 sponsored,



FIRST FORD CAR, 1896



FORD CONVERTIBLE HARD-TOP



HENRY FORD

NBC Photo

at his own expense, a private peace mission to "get the boys out of the trenches by Christmas." That the "peace ship" proved a painful fiasco did not detract from the earnestness of the attempt. He left much of his personal fortune—estimated at about \$1,000,000,000, perhaps the largest *earned* personal fortune in history—to the Ford Foundation (*q.v.*).

Ford, HENRY, 2ND, industrialist, grandson of Henry Ford (*q.v.*), born in Detroit, Mich., Sept. 4, 1917. He left Yale Univ. in 1940 to work in one of the Ford plants. A year later, during World War II, he entered the U.S. Navy but was released in 1943 after the death of his father, Edsel Ford, who had been president of the company. Under the guidance of his grandfather, he became an efficient executive and in 1945, at the age of 28, became president of the \$1,000,000,000 Ford industrial empire.

Ford, PAUL LEICESTER, historian and novelist, born in Brooklyn, N.Y., March 23, 1865; died in New York City, May 8, 1902. He studied at private schools and traveled extensively in America and Europe. Among his historical works are "The True George Washington" and "The Many-Sided Franklin." His fiction includes "The Honorable Peter Sterling" and "Janice Meredith." He also prepared an excellent edition of the works of Thomas Jefferson.

Ford, SEWELL, author, born in South Levant, Me., May 7, 1868; died in Keene, N.H., Oct. 26, 1946. He wrote copiously, but is best remembered for a series of "Western" stories about stock characters known as "Torchy" and "Shorty McCabe," many of which were filmed in silent movies and later remade as talkies.

Ford Foundation, a private, nonprofit corporation established by Henry and Edsel Ford (*qq.v.*) in 1936, with offices in New York, N.Y. The corporation's assets of \$748,171,131 (1957) are derived from gifts and bequests by the founders. The foundation seeks to strengthen American society by identifying problems of national concern and underwriting efforts toward their solution, principally through educational means. Henry T. Heald, former chancellor of New York Univ., became president of the foundation in 1956.

Foreign Legion (*för'in lē'jün*), a term used colloquially for the *Légion étrangère*, or French Foreign Legion, created by the French government on March 9, 1831, to proceed against native Algerian tribes.

Originally it included many soldiers who had fought under Napoleon, and in succeeding years attracted adventurers and soldiers of fortune seeking anonymity in its ranks. Enlisted men are all volunteers; noncommissioned officers and officers are career French soldiers. The French Foreign Legion also fought in the Crimea (1855-56), in Mexico (1863-67), the Franco-Prussian War (1870-71), and in World War I (1914-18), where out of a total of 42,000, including 600 Americans, 11,000 were killed. It consists of four infantry regiments and one cavalry regiment, of which the 1st Regiment with nine battalions is the largest. The French Foreign Legion is normally stationed in Algeria, Indo-China, Syria, and Morocco, where the Legionnaires contributed to the defeat of natives rebelling under Abd-el-Krim in 1925. The composition of the Legion has been said to average 50% German, 10%

Russian, 15% Austrian, Hungarian, and Czech, and 25% other nationalities.

In World War II the 15th half brigade of the Legion fought at Narvik, Norway, and, following the fall of France, as a unit of the Free French forces with the British until Allied victory. In June 1940, following the Vichy-German armistice, Legion recruiting was stopped in France, but was resumed in September 1944. In March 1945, foreign veterans wishing to leave the Legion were demobilized. After the war units were sent to Indo-China.

There is also a Spanish Foreign Legion.

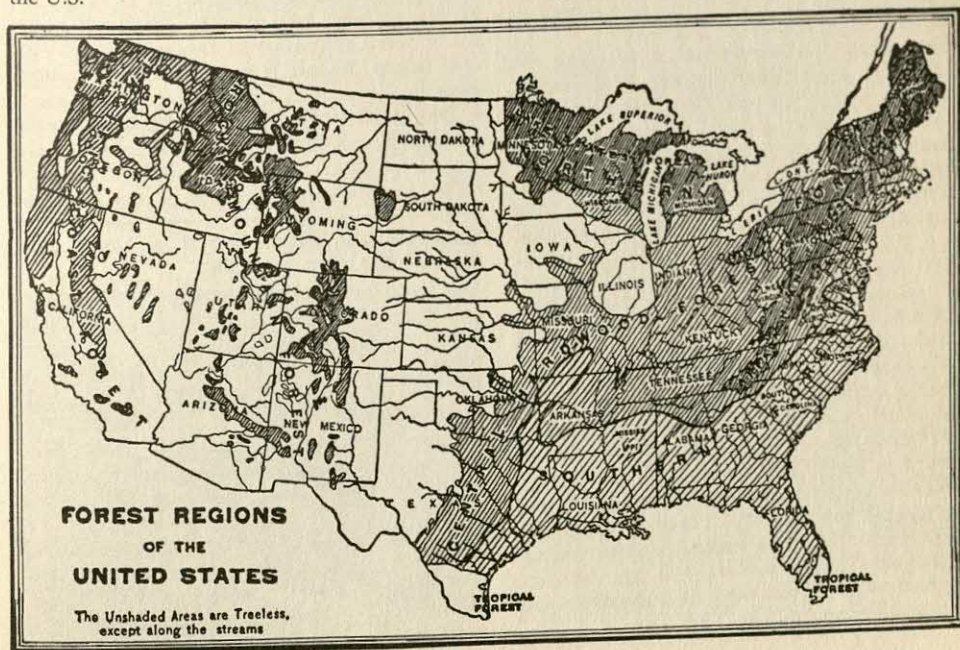
Forest (*fōr'ĕst*), a large tract of land covered with a natural growth of trees and underbrush, although often with intervening spaces of open ground. The forest area of the world amounts to about 9,482,000,000 acres, roughly 29 per cent of the earth's land surface, exclusive of the polar regions. In the U.S., not including Alaska, Hawaii, and insular possessions, forest land totals *ca.* 647,000,000 acres, or *ca.* 33 per cent of the total land area.

The countries of Europe have provided protection by laws designed to preserve the forests for judicious use and prevent wholesale and needless destruction. Such acts of preservation operated to preserve many desirable tracts in Austria, Germany, France, and other countries, of which Epping Forest, near London, is a good example. Similar laws have been passed in Canada, and there has been legislation aiming to extend rather than abridge the forest area in the U.S.

The Nebraska State Board of Agriculture in 1874, under the suggestion of J. Sterling Morton, recommended that a day be dedicated each year to the planting of trees. This suggestion was acted upon by all the states and territories, not only through individual effort, but by the formal effort of public schools. As a consequence many trees and tracts of timber have been planted and cultivated on private and public property. See *Arbor Day*.

Principal forest land areas in the U.S. are located as follows: (1) in the northeastern and upper Great Lakes states, about 131,000,000 acres; (2) in the Southern states, about 197,000,000 acres; (3) in the central states, about 43,000,000 acres; (4) in the Great Plains states, about 35,000,000 acres; (5) in the coastal sections of Washington, Oregon, and northern California, about 25,000,000 acres; (6) in the remainder of these and other Far Western states, about 213,000,000 acres. The forest growth in the Central and Great Plains states is primarily hardwood; that in the other sections is primarily softwood.

Natural forests are found widely distributed where moisture is abundant and the temperature is favorable to plant growth. The forests of the Torrid Zone are the most luxuriant and cover vast areas along the streams and bodies of water, even to a considerable height above sea level. As we proceed north and south from the Equator we find the forests gradually decreasing in density and size of trees up to the higher latitudes, where they finally become rare and gradually disappear. The most extensive



forests in the world are found in the valleys of the Amazon and Orinoco, the lake region of Africa, and in the southern parts of Eurasia. The higher altitudes, even in tropical countries, are destitute of forest growth, though plant life thrives in such regions at a much higher elevation than in the Temperate Zone and extends far into the higher latitudes, even to regions having much soil perpetually below the freezing point of water.

Timber of much value is obtained from the Philippines, where the forest areas exceed 40,000,000 acres. Canada has about 1,000,000 sq. m. of standing timber and contains the largest white pine areas in the Western Hemisphere. Russia has the largest forest areas in the world, a total of 812,640,600 acres, three-fourths of which belong to the government.

Forester (*för'ës-tër*), CECIL SCOTT, writer, born in Cairo, Egypt, Aug. 27, 1899. The son of a British army officer, he was educated in England at Dulwich Coll. His first novel, "Payment Deferred" (1924), was a murder story which he later adapted for stage and screen. He wrote several biographies in the 1920's, but he is most famous for his recent novels. They include "Flying Colors" (1939), "Captain Horatio Hornblower" (1939), "To the Indies" (1940), "The Captain From Connecticut" (1941), "The Ship" (1943), "Lord Hornblower" (1946), "The Sky and the Forest" (1948) and "Lieutenant Hornblower" (1952). "Ship of the Line," published in 1938, won him the James Tait Black Memorial Prize. Although suffering from progressive arthritis and paralyzed from the waist down, he has been active as a screen writer in California.

Foresters (*för'ës-tërz*), ANCIENT ORDER OF, a fraternal organization founded in Yorkshire, England, in 1745. Though it has been maintained continuously since that time, its material growth dates from the early part of the 19th century. The first court was established in America in 1832, at Philadelphia, Pa., after which it spread rapidly in Canada and the U.S. Today it has about 9,500 courts, with 1,000,000 members, of whom about 50,000 are in Canada and the U.S. Courts are maintained in 36 countries. In Great Britain and Ireland it has about 600,000 members. The benefits distributed annually aggregate \$5,000,000.

Foresters, INDEPENDENT ORDER OF, a society founded in 1874 at Newark, N.J. It was reorganized in 1881 and maintains courts in Canada, the U.S., Great Britain, Australia, and other countries. The society has about 5,000 local courts, which are under the direction of high courts, and the general government is vested in a supreme court. The order is both fraternal and benevolent, has about 150,000 members, and has disbursed large sums in benefits since its organization. Its headquarters are in New York City.

Foresters of America, a benevolent and fraternal society, reorganized under its present name in 1895. It originated from the Ancient Order of Foresters (*q.v.*), but separated from the mother organization in 1889. The annual benefit payments approximate \$1,125,000. Since its organization over \$54,000,000 has been disbursed. Its membership list is about 200,000, in some 1,100 lodges, and its headquarters are at Jersey City, N.J.

Forestry (*för'ëst-rÿ*), the management and preservation of tree growth for the general welfare. This branch of economic study is concerned with the planting of trees and the utilization of both cultivated and native forests with the view that the best possible good may be obtained now and in the future.

It is estimated that when the white man first came to America, the forest area amounted to about 800,000,000 acres, including the 163,000,000 acres now classed as noncommercial. Of the other 637,000,000 acres, about 176,000,000 have been cut over and converted to food crops, pasture, and other purposes, while an additional 416,000,000 have been cut over but have continued as tree-growing land. Thus, the present commercial forest land includes approximately 416,000,000 acres of second-growth trees and 45,000,000 acres of old-growth timber. The annual harvest of timber in this country amounts to approximately 12,200,000,000 cu. ft., while about 1,500,000,000 cu. ft. is lost annually by fire, insects and disease. Annual forest growth is estimated at 13,400,000,000 cu. ft. Drain of timber of all types is thus about 1.02 times total growth. Thirty years ago, forest drain was estimated at 4.34 times growth, and before World War II it was 1.19 times growth.

This trend is due partly to the fact that the growth of trees decreases and finally halts in old age; hence, in an old-growth forest there is very little net growth because there is not space for

SEEDLINGS ARE HAND-PLANTED IN AREAS WITH NO NATURAL SEED SOURCES



young trees to thrive until the old ones fall of decay, or are burned, or harvested. Thus, the continued harvesting of timber in the remaining 100,000,000 acres of old forests is decreasing the area where growth is static, and their resultant conversion to second-growth forests is correspondingly increasing the area where growth is active. Not infrequently, this conversion boosts the annual net growth per acre from zero to as much as 50 to 100 cu. ft. Accordingly, it can be expected that the present 416,000,000 acres of second-growth forests will eventually reach a total of 460,000,000 acres, with a corresponding increase in the annual volume of wood which their growth creates. A second and important factor, however, in the increasing volume of growth in the American forests is a continuing improvement in management practices. In fact, the increasing area of growth itself is one of the results of management practices of modern forest owners to assure adequate forests in the future.

Except where forest land is to be converted to some other purpose, the objective of modern forestry technique is to keep such land continuously productive of timber. The basic tenet of this technique is to leave enough parent stock standing to reseed the area after a logging operation, unless adequate numbers of seedlings are already growing there. Inasmuch as most species are highly productive of seeds, three or four parent trees left standing are adequate in most cases promptly to reseed an acre or more.

Equally important to good forestry is adequate protection of trees or seedlings from fire. In case fire destroys both seedlings and parent stock, forestry care provides for hand-planting of seedlings grown in nurseries. Because it adds to the cost of growing timber, hand planting is regarded primarily as an emergency measure. For fire protection in the commercial forests, it is customary to erect high watch towers where lookouts can view vast areas and spread an alarm to fire fighters whenever they see smoke or flames. Millions of dollars are spent annually by owners and by public agencies in building and maintaining these towers, and roads, fire trails, and other fire-fighting equipment. Similar great efforts are expended in combating insects and diseases which are harmful to trees. Forestry management also includes maintenance of forests for game and wildlife production, recreation, etc.

Forestry has been a branch of study in Europe for many years, especially in Germany. The 151 national forests of the U.S. embrace a total of 179,685,328 acres, while total forest land amounts to about 624,000,000 acres, much of which is privately owned. There are also state and municipal forests. The Bureau of Forestry, established in 1901 under the Department of Agriculture, is an important branch of the government of the U.S.



TREE-FARMING IN MODERN FORESTRY

Although modern selective logging provides new growth through leaving seed trees, sometimes planting is necessary. These photographs show the rapidity of growth in a pine plantation. They were taken five years apart on the same spot

The chief aim is to develop scientific forestry. Literature sent out by this bureau shows the benefits of studying forestry, which include an investigation of climatic influence upon shrubs and trees. Now called the U.S. Forest Service, it has organized an extensive fire-protection program, including lookout stations and fire fighters.

One advantage of forests is the fact that they conserve moisture and thereby increase rainfall. Also, they temper hot and cold winds and are useful in reclaiming tracts of almost barren land. The benefits of wind-breaks are seen on the great prairies of Canada and the U.S., where innumerable hedges and groves have been planted. Parks and clusters of trees furnish covering for birds and add to the enjoyment of man. The schools of forestry aid in studying the adaptation of various trees to particular localities, especially as they are influenced by soil, moisture, and temperature, and much valuable information has been given in regard to the selection of land for reforestation and the care to be given growing trees.

Forestry has been given great impetus in recent years, partly as a result of economic conditions. In 1930, fewer than 400 professional foresters were employed by the industry. By 1948, the number had increased to 2,500. Such national

programs as that of "tree farming" and the "Keep America Green" movement encourage better forest management and forest-fire prevention. Twelve regional experiment stations and the various forestry schools carry on forestry research. Most states are increasing production of nursery stock for forest planting, largely on private lands. Many states have adopted constitutional or legislative provisions for forestry and forest regulation. The American Forestry Assn. promotes interest by holding meetings and issuing reports. See also *Fire; Lumber; Wood*.

Forge (*fôrj*), an open fireplace or hearth with forced draft for heating iron, steel, or other substances. The term is also applied to a workshop where metals are hammered and shaped by the aid of heat. Forges were formerly made of brick, with a large leather bellows to furnish the blasts of air, but at present are made largely of iron and the blast of air is provided by a rapidly rotating fan wheel. Forging processes are employed to give required shapes to metal parts by pressure. Modern duplicate forgings are formed in dies in a drop hammer, forging machine, or forging press.

Forgery (*fôr'jēr-y*), in law, is the false making or materially altering, with intent to defraud, of any writing which, if genuine, might seem to be the foundation of a legal liability. To constitute the crime of forgery it is not necessary that someone should have been injured or defrauded. The making with fraudulent intent, and without lawful authority, of any writing is of itself a sufficient completion of the offense. "Writing" includes printed, typewritten, or engraved instruments. Some instruments which may be the subject of forgery are promissory notes, bills of lading, checks, receipts, bonds, orders for goods, deeds, mortgages, and wills. At common law forgery belonged to a class of misdemeanors called "cheats"; but because of the serious wrongs and frauds often perpetrated through this form of crime, it came in time to be legally distinguished by the particular name of forgery. Forgery is generally punishable by fine or imprisonment, or both.

Forget-Me-Not (*fôr-gěi'mē-nôt*), a genus of plants generally diffused over the North Temperate Zone. The flower is small and is blue in most species. It has five petals and a salver-shaped corolla. Because of its brilliancy of color, and of its being an emblem of constancy in friendship and love, it is a favorite flower in most countries. It is the official flower of Alaska. The dark blue forget-me-not of the Azores is cultivated extensively. The present name is from the German —*Vergiss-mein-nicht*. The former English name, *scorpion grass*, is rarely used.

Forks (*fôrks*). See *Cutlery*.

Formaldehyde (*fôr-māl'dē-hīd*), a colorless,

volatile liquid, chemically intermediate between formic acid and methyl alcohol, discovered by Hofmann in 1867. It is used in making dyes and as a disinfectant.

Formic Acid (*fôr'mīk*), a simple fatty acid of organic chemistry, so named from its being found in the bodies of ants. It is prepared artificially by dissolving sugar, starch, or tartaric acid in water, then adding sulphuric acid, and distilling the mixture on peroxide of manganese. Pure formic acid solidifies at a low temperature, forming a crystalline mass. It is strongly acid, colorless, and transparent, and has a pungent odor. It is very corrosive and, when placed on the skin, causes intense irritation.

Formosa (*fôr-mō'sā*), or TAIWAN, an island lying off the eastern coast of China, in the Pacific Ocean. It is separated from the coast of China by a strait about 85 m. wide. The island has a length of 240 m., an average breadth of 72 m., and an area of *ca.* 13,800 sq. m. The surface is mountainous, especially in the interior. Mt. Niitaka is the culminating peak, having a height of 13,600 ft. A part of the surface is made up of barren clay hills, but the plains and valleys are fertile. Among the principal products are sugar, rice, silk, tea, tobacco, camphor, vegetables, coal, and fruits. The climate is healthful and the rainfall abundant. The principal products of the island are sugar, tea, rice, and fruit. Gold, silver, coal, and copper are mined. The native population consists largely of the Chinese, descended from those who settled there in the 7th century, but there are also two groups of aborigines,

FORMOSA CITY SCENE

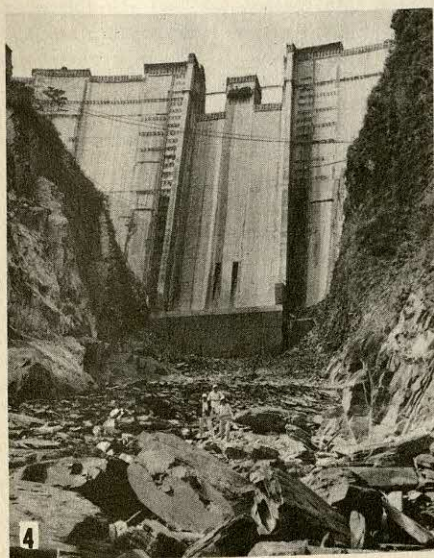
Courtesy Ewing Galloway, N. Y.





FORMOSA—ISLAND OF PROGRESS

Aspiring teachers are trained at Normal Univ. (1), in Taipei (courtesy Chinese News Service). The inscription, "Remember what happened at Chul!", in a copy of Chiang Kai-shek's calligraphy, is carved on this rock (2) atop Quemoy's highest hill, 800-ft. Tai-wu Shan. The slogan recalls an ancient battle in which the king of Chu recaptured his kingdom after losing 71 of his 72 cities. Pineapple is loaded at Pintung (3); in 1958 Formosa was the world's fourth-largest pineapple producer. The 374-ft.-high Wu-Sheh Dam at Wan-Ta, under construction in this photo (4), was completed in 1958 at a cost of \$10,000,000; built with American aid, it boosted Formosa's industrial power by 10 per cent. Formosan farmers harvested 1,900,000 metric tons of rice in 1958—the greatest yield in the island's history (5), with the aid of improved methods of cultivation taught by experts and U.S.-style 4-H Clubs (photos by Hamilton Wright)



ethnologically related to the Malays. Population, ca. 8,265,000.

Formosa is thought to have been known to the Chinese at a very early time, but it was not settled by them. In the 16th century, some Spanish and Portuguese arrived, and in 1624 the Dutch built a fort. The Dutch were ousted, and a large part of the island taken (ca. 1661) by followers of the Ming dynasty that had just lost power in China. By 1700, the territory was in the hands of the Manchus, and there was a further Chinese influx. The treaty of Tientsin (1858) opened Formosa to foreign trade. After the Sino-Japanese War, in 1895, the island was ceded to Japan.

In 1941 the Formosan Revolutionary League was formed for the purpose of overthrowing Japanese authority, and the Chinese government helped (1943) to establish the Formosan provincial headquarters in China. Formosa was returned to China when Japan was defeated in 1945. In late 1949, following the Chinese Communist conquest of the Chinese Mainland, the Nationalist government retreated to Formosa and established its capital at Taipei. Although, earlier, the U.S. had refused to commit itself to defending the Nationalist forces on Formosa, after the outbreak of war in Korea (q.v.) in 1950, the U.S. Navy was ordered to prevent a Communist attack on Formosa. The Nationalist Chinese government was requested not to widen the conflict and to abstain from an attack on the Mainland. Since then the Communists have repeatedly bombarded nearby offshore islands, but have attempted no actual invasion of Formosa. In 1955 the U.S. and Nationalist China ratified a mutual defense treaty by which the U.S. pledged itself to the defense of Formosa and the Pescadores Islands.



JAMES V. FORRESTAL

Forrestal (fôr'es-tl'), JAMES VINCENT, investment banker, cabinet member, born in Beacon, N.Y., Feb. 15, 1892; died in Bethesda, Md., May 22, 1949. After studying at Dartmouth Coll. and Princeton Univ., he served in World War I as a naval aviator. After the war, he joined Dillon, Read & Co., Wall Street brokers, becoming a partner in 1923, a vice president in 1926, and

president in 1938. In 1940 he was named administrative assistant to President Franklin D. Roosevelt, becoming Under Secretary of the Navy two months later. In 1944 he was made Secretary of the Navy, and in 1947 he became the first Secretary of Defense (see *United States, Departments of*). He resigned in March 1949, because of ill health, and two months later he committed suicide. His "Diaries" (1951, edited by Walter Millis) contain comments on the Washington scene during and after World War II.

Forrest (fôr'ĕst), EDWIN, dramatic actor, born in Philadelphia, Pa., March 9, 1806; died there, Dec. 12, 1872. In 1826 he appeared at the New York Park Theatre, where he gained great popularity in the role of *Othello*. In 1836-37 he played with success in London and afterward visited other European cities. His successes were principally as *King Lear*, *Richard III*, and *Coriolanus*. Intense jealousy arose between Forrest and William C. Macready (q.v.), the favorite of the English stage, when, in 1845, Macready partisans hissed Forrest's *Macbeth*, and Forrest hissed Macready at Edinburgh. This rivalry led to the Astor Place Riot (1849) in New York City, a demonstration for Forrest that caused the death of about 22 persons, most of them shot by police trying to restore order. Forrest made his last stage appearance in Boston in 1871 and by his will established the Edwin Forrest Home for Retired Actors in Philadelphia.

Forrest, JOHN, 1ST BARON FORREST, explorer, born in Bunbury, Western Australia, Aug. 22, 1847; died at sea, Sept. 4, 1918. He was educated at the Bishop's School in Perth and in 1865 entered the survey department of Western Australia. In 1869 he commanded an exploring expedition into the interior and the following year explored the region from Perth along the south coast to Adelaide. In 1874 he explored the area between Adelaide and Port Darwin, making a journey of nearly 2,000 m. Then becoming interested in government affairs, he was premier of Western Australia (1890-1901), minister of defense of the Commonwealth of Australia (1901), and minister of state for home affairs (1903). He was treasurer in 1905-07, 1909-10, 1913-14, and 1917-18. Created a baron in 1918, he was the first Australian statesman to be raised to the peerage. His writings include "Explorations in Australia" (1875-76) and "Western Australia" (1884-87).

Forrest, NATHAN BEDFORD, soldier, born in Chapel Hill, Tenn., July 13, 1821; died in Memphis, Oct. 29, 1877. At first a planter, he became a slave dealer, and in 1861 raised a cavalry battalion to defend Ft. Donelson for the Confederacy. During the Civil War he fought at Shiloh and Chickamauga, became major general

(1863), and in 1864 captured Ft. Pillow by a skillful assault. In 1865 he was promoted to lieutenant general. He surrendered on May 9, 1865, to Gen. E. R. S. Canby (*q.v.*) at Selma, Ala. After the war he lived in Memphis, where he was president of the Selma, Marion & Memphis R.R. He was also active in the Ku-Klux Klan.

Forster (*fôr'stēr*), EDWARD MORGAN, novelist and lecturer, born in London, England, Jan. 1, 1879. After studying at King's Coll., Cambridge, he visited Italy, where he wrote the novels "Where Angels Fear to Tread" (1905) and "Room With a View" (1908). After "Howard's End" (1910), a novel, and "The Celestial Omnibus" (1911), a volume of short stories, there followed a period of little writing. He was stationed in Egypt during World War I. Two visits to India in 1912 and 1922 provided material for his best-known book, "A Passage to India" (1924). This was followed by his first volume of criticism, "Aspects of the Novel" (1927). Among his other works are "The Eternal Moment" (1928), a collection of short stories; "Abinger Harvest" (1936), a miscellany; "What I Believe" (1939) and "Two Cheers for Democracy" (1951), essays; "The Hill of Devi" (1953), an account of his experiences in India; "Marianne Thornton" (1956), a biography; and the libretto (with Eric Crozier) for Benjamin Britten's opera "Billy Budd" (which had its *première* in 1951).

Forster is a thoughtful writer with a delicate, subtle prose style that places him among the most gifted writers of the 20th century. In his work, he deals with the conflict between appearance and reality. On one level, it is the conflict between the man of convention, interested in manners and property, and the man of instinct, interested in human relationships; and on another level, as in "A Passage to India," it is the conflict between two societies, the English and the Indian, which he describes at length.

Forster, JOHN, political biographer and critic, born in Newcastle, England, April 2, 1812; died in London, Feb. 2, 1876. Educated at the Univ. of London, he became a critic on the *Examiner* and was its editor (1847-56). Among his writings are "Lives of the Statesmen of the Commonwealth" (5 vols., 1836-39); "The Life and Times of Oliver Goldsmith" (1848); and his great study, "The Life of Charles Dickens" (3 vols., 1872-74).

Forsyte Saga (*fôr'sīt sū'gā*), THE, collective title of a series of novels by the English author John Galsworthy (*q.v.*). "The Forsyte Saga," published in 1922, comprises "The Man of Property" (1906), "The Indian Summer of a Forsyte" (1918), "In Chancery" (1920), "Awakening" (1920), and "To Let" (1921). The books relate the history of an upper middle class propertied

family in Victorian and Edwardian England.

Fort Ancient (*fôrt ān'shənt*), a former Indian fortification, now preserved in Ft. Ancient State Memorial Park, 6 m. s.e. of Lebanon, Ohio, on the Little Miami River. The fort is a large, prehistoric earthwork enclosing about 100 acres and including burial mounds and village sites.

Fort Atkinson (*āt'kin-s'n*), a city in southern Wisconsin, 35 m. s.e. of Madison, on the Rock River. Served by the Chicago & Northwestern R.R., it is a trade and shipping center for the surrounding dairy region. It was settled *ca.* 1836 and incorporated in 1878. Population, 1950, 6,280.

Fort Augustus (*ā-gūs'tūs*), parish of Inverness-shire, Scotland, at the head of Loch Ness, about 30 m. s.w. of Inverness, on the Rivers Oich and Tarff and the Caledonian Canal. Originally called Kilchumin, the fort was built in 1716 and expanded in 1730. In 1745 it was captured by the Jacobites and demolished. Restored after the Battle of Culloden, it then received its present name in honor of the victorious general, William Augustus, Duke of Cumberland. The fort was purchased by the 12th Lord Lovat in 1857, and in 1876 his son presented it to the English order of the Benedictines. The monks converted it into a college, monastery, and hospice for the higher education of the Roman Catholic nobility. Now called St. Benedict's Abbey, it is considered one of the finest ecclesiastical structures in Scotland.

Fort Banks (*bāngks*), U.S. military post at Winthrop, Mass., 7 m. n. of Boston. Established in 1891, it was closed between 1946 and 1951, and later became a Nike missile base.

Fort Bayard (*bā'yərd*), U.S. military reservation in New Mexico, established in 1866 as a garrisoned post, and changed into a general military hospital for tubercular patients in 1900.

Fort Belvoir (*bēl'vōr*), U.S. Army post 9 m. s. of Alexandria, Va. It was established (1918) as Camp Humphreys for the Corps of Engineers. During World War I, the Engineer School was moved here from Washington, D.C. The camp received its present name in 1935.

Fort Benjamin Harrison (*bēn'jā-mīn hār'i-s'n*), U.S. military post in Indianapolis, Ind. Established in 1903, it is the site of the Adjutant General's School, U.S. Army.

Fort Benning (*bēn'ing*), U.S. military post 9 m. s. of Columbus, Ga. Located here since 1918, the 220,000-acre post houses the Infantry School.

Fort Bliss (*blīs*), U.S. military post on the Rio Grande, 7 m. n.e. of El Paso, Texas. It is the site of the U.S. Army Air Defense School.

Fort Bowyer (*bō'yēr*), a former fort on Mobile Point, Mobile Bay, Alabama. It sustained a British attack during the War of 1812.

Fort Bragg (*brāg*), U.S. military post 10 m. n.w. of Fayetteville, N.C. Established in 1918,

it is the site of the U.S. Army Special Warfare School.

Fort Canby (*kān'bé*), U.S. military post on the Columbia River, Pacific County, Wash. It was first named Ft. Cape Disappointment; the name was changed in honor of Gen. Edward R. Canby (*q.v.*). It was declared surplus in January 1948.

Fort Caswell (*kās'wēl*), former U.S. military post near Southport, N.C. Established in 1825, it was held by the Confederates during the Civil War. The major portion of the fort was sold in 1926.

Fort Clark (*klār'k*), U.S. military post in Kinney County, Tex., comprising 3,960 acres (1941). It was declared surplus in May, 1944.

Fort Collins (*kōl'inz*), county seat of Larimer County, Colo., 64 m. n. of Denver, on the Cache la Poudre River and on the Union Pacific and other R.R.'s. It is a trading and shipping center for a large agricultural area. Colorado Agricultural and Mechanical Coll. is located here. The place was settled in 1864 and incorporated in 1879. Population, 1940, 12,251; in 1950, 14,937.

Fort Crook (*krōō'k*), U.S. military post on the Burlington and the Missouri Pacific R.R.'s., 11 m. s. of Omaha, Nebr. It is at present the site of the Offutt Air Force Base.

Fort Dearborn. See *Dearborn, Fort*.

Fort-de-France (*fōr-dē-frāns*), formerly Ft. Royal, capital of Martinique, French West Indies. Population, ca. 52,000.

Fort de l'Écluse (*dē-lā-klūz'*), fortress at the foot of Mt. Credo, in the French Dept. of Ain, 14 m. s. of Geneva, Switzerland. Erected by the dukes of Savoy and destroyed by the Swiss in the 16th century, it was rebuilt at the command of Louis XIV. Again dismantled by the Austrians in 1815, it has since been restored.

Fort Dodge (*dōg*), county seat of Webster County, Iowa, on the Des Moines River, about 89 m. n.w. of Des Moines. It is on the Chicago Great Western, the Illinois Central, the Minneapolis & St. Louis, and other R.R.'s. Points of interest include the Dolliver Memorial State Park, 14 m. s.e. of the city. Manufactures include clothing, tile, brick, stucco, and chemicals. The surrounding country possesses extensive dairy interests and is rich in coal, gypsum, and clay deposits. Population, 1920, 19,333; in 1940, 22,904; in 1950, 25,115.

Fort Douglas (*dūg'las*), former U.S. military post situated in Salt Lake County, Utah, adjacent to Salt Lake City. Established as Camp Douglas in 1862, it was made a military reservation in 1867. The post was declared surplus in 1948 and the land was transferred to various Federal and local agencies.

Fort Du Pont (*dū-pōnt'*), former U.S. military post opposite Pea Patch Island in New Castle

County, Del. It occupied a reservation of 761 acres in 1891, was later reduced to 321 acres (1937), and in 1945 was assumed by the Public Buildings Administration.

Fort Duquesne (*dū-kān'*). See *Pittsburgh*.

Fort Erie (*ēr'ē*), a town in Welland County, Ontario, on the Niagara River, nearly opposite Buffalo, N.Y. It is an industrial and railroad center, in a large summer resort district, accessible to the U.S. by Peace Bridge. Fort Erie stands on the site of Old Ft. Erie, which played an important role in the War of 1812. Originally built in 1764, the fort was occupied in 1813 by the British under General Vincent, and later by the American forces. The fort was destroyed when the Americans abandoned Canada in 1814, but it was rebuilt in 1938 and now serves as a museum. Population, 1950, 7,527.

Fort Ethan Allen (*ē'than āl'ēn*), formerly a U.S. cavalry post near Burlington, Vt. Authorized in 1892 and first occupied in 1894, the post had a reservation of about 959 acres (1941). It was declared inactive in 1943 but was retained by the Army for reserve components.

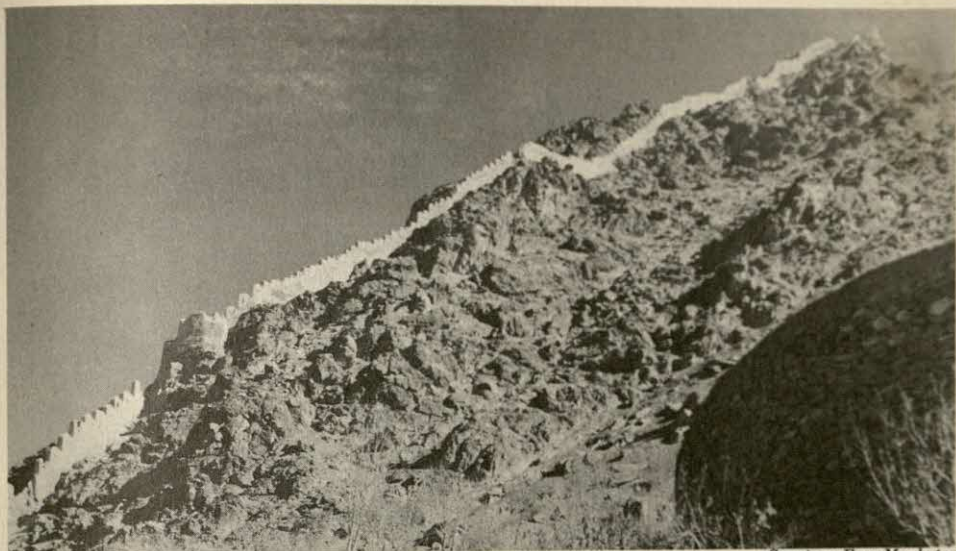
Fort Fisher (*fish'ēr*), a fortress below Wilmington, N.C., at the entrance to the Cape Fear River. General Butler led a force of 6,000 Union soldiers against the fortress in December 1864, and was aided by Adm. Porter with a fleet of ironclads. The project of taking the fortress was abandoned after two days, but on Jan. 13, 1865, a second attempt was made by Gen. Terry and Adm. Porter which resulted in its capture. The Union army took about 2,000 prisoners and a large number of heavy guns.

Fort Flagler (*flāg'lēr*), U.S. military post, 5 miles s.w. of Port Townsend, in Jefferson County, Wash. It is a subinstallation of Fort Worden (*q.v.*).

Fort Genetaha (*gē-nēn'tā-hā*), an old French fort at Syracuse, N.Y., deriving its name from the Indian "*Genetaha*," meaning Lake Onondaga. Fort Ste. Marie of Genetaha was established in July 1656 by Jesuit priests, who invaded the region as members of a French colony. Because of a pest of mosquitoes plus a warning of a forthcoming attack by the Indians, the French decided to quit the fort in 1658.

Fort George (*jōrj*), former U.S. fort at the upper end of Manhattan Island, N.Y. It was captured by the Americans from the British in 1783 and later demolished (1790-91). It was originally called Fort Amsterdam by the Dutch.

Fort George G. Meade (*mēd*), U.S. military post in Ann Arundel County, Md., 18 m. s.w. of Baltimore. It is Second Army headquarters and also has miscellaneous army units stationed there. Originally known as Camp Meade in honor of Gen. George G. Meade (*q.v.*), the fort was known as Fort Leonard Wood for



Courtesy Esso Marketer

WALL SURROUNDING KABUL, AFGHANISTAN

This wall, the most primitive type of fortification, follows the contours of the mountain tops, combining man-made with natural protection

a short time. It was officially renamed Fort George G. Meade by Act of Congress in 1929. The post was established in 1917 and made a permanent military reservation in 1928.

Fort Gibbon (*gīb'b'n*), former garrison post at the confluence of the Tanana and Yukon Rivers in Alaska. It was discontinued in 1923 and the reservation was relinquished in 1941.

Fort Grant (*grānt*), a former U.S. military post in Arizona, established as a protection for travelers against the Apaches. The site and name of the camp were changed several times before 1879 when the fort was established 70 m. s.e. of Mt. Graham. It was later discontinued and the site was abandoned in 1905.

Fort Greble (*grē'b'l*), former U.S. military post on Dutch Island, Narragansett Bay, R.I. It was declared surplus and was discontinued in December 1947.

Forth (*fórh*), a river of central Scotland, formed by the confluence of the Dhu and Duchray in Perthshire. The river is 114 m. long and merges into the Firth of Forth, a body of water extending 50 m. east from Alloa to the North Sea. It has important salmon and herring fisheries. The Forth Cantilever Bridge, a 5,000-ft. railway viaduct at Queensferry, was completed in 1889 at a cost of \$13,000,000.

Fort Hamilton (*hām'il-tūn*), U.S. military post on the southwest shore of Long Island, commanding the Narrows between Upper and Lower New York Bay. First occupied in 1831, it is one of the important defenses of New York.

Fort Hancock (*hān'kōk*), U.S. military post, at Sandy Hook, N.J. The area was acquired as a

reservation in 1806, and some military structure was erected before 1812. Construction was begun on a stone fort in 1857, which was later garrisoned (1863-66). The Sandy Hook Ordnance Proving Grounds were established on the reservation in 1882; the area was improved and regarrisoned in 1890; and in 1895 it was named Fort Hancock, in honor of Maj. Gen. Winfield Scott Hancock (*q.v.*). The fort was declared surplus in 1950, but was reactivated in May 1951.

Fort Henry AND **Fort Donelson** (*hēn'rī, dōn'l-s'n*), two forts built by the Confederates in Tennessee, near the border of Kentucky. Fort Henry was located on the Tennessee River, ca. 10 m. from Ft. Donelson, which was on the Cumberland River, ca. 40 m. from where the rivers flow into the Ohio. The forts were strongly manned in 1861 and controlled the entrance to the southwest by means of the Cumberland and Tennessee rivers. General U. S. Grant (*q.v.*), assisted by a river fleet under Comdr. Andrew H. Foote (*q.v.*), decided on an attack on Ft. Henry in February 1862. Outgunned by the river boats and outnumbered by Gen. Grant's troops, put ashore downstream, all but ca. 100 Confederate soldiers were evacuated to Ft. Donelson. The remaining garrison was compelled to surrender Ft. Henry on Feb. 6. General Grant attacked Ft. Donelson on Feb. 13, and two days later the commander, Gen. Simon B. Buckner, requested Gen. Grant to appoint a commission to discuss terms of capitulation. To this Gen. Grant sent his famous reply: "No terms except unconditional and immediate surrender can be accepted. I propose to move immediately upon your works." Buckner

FORT HOLABIRD

surrendered the fort that night with 14,000 men. See also *Fort Donelson National Military Park*.

Fort Holabird (*hōl'ə-búrd*), a U.S. military installation near Baltimore, Md., established in 1917 and so designated in 1950. It houses the Army Intelligence Center and the Army Intelligence School. The Claims Division of the Judge Advocate is also located here.

Fortification (*fór-ti-fi-kā'shūn*), a military defensive work, erected for the purpose of strengthening a place or position. The term also applies to the science of fortifying a position in such a way that it may be held by a body of men much inferior in number to the assailants. It implies a knowledge of the resistant power of materials as well as of advantage in position, so that the construction may be devised in a manner that will ensure great enemy losses in the event of attack. Fortifications may be termed *permanent* or *temporary*—or *field*—fortifications. For additional illustration, see preceding page.

The history of fortifications is as old as that of offensive and defensive warfare, though the process of construction has undergone numerous modifications, necessitated largely by improvements in the implements of war. The student of



FORTIFICATIONS (from top to bottom)

FORTRESS, 12th CENTURY

DUNLUCE CASTLE, NEAR BELFAST, IRELAND

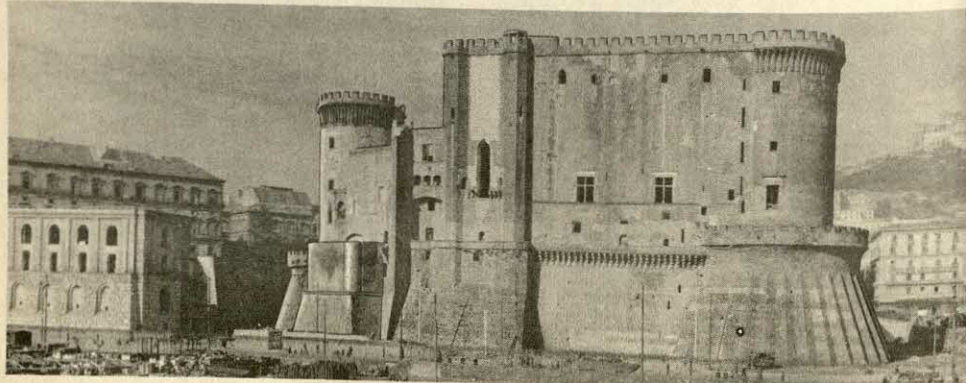
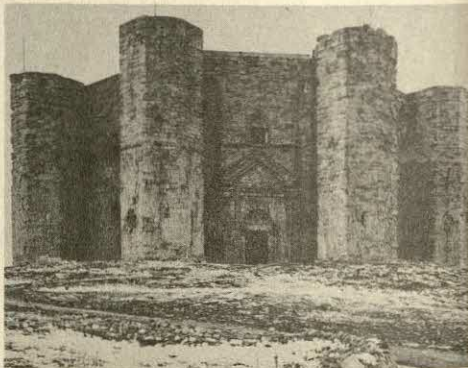
In contrast to real fortresses, medieval castles of this type comprise only a fortified complex of buildings (Courtesy Canadian Pacific Steamships Ltd.)

CASTEL DEL MONTE, SOUTH ITALY

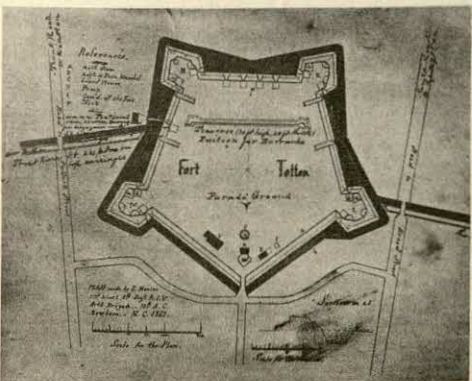
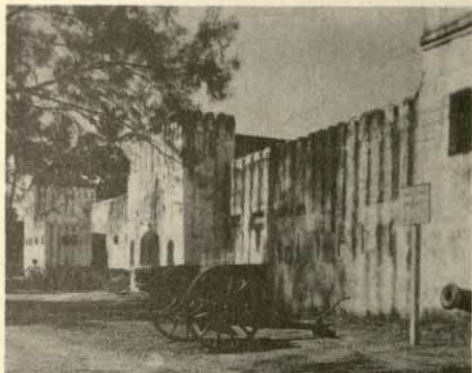
Built in the 13th century, this is one of the few medieval forts still preserved intact. It is characterized by its polygonal layout, repeated in each of the individual towers.

CASTEL DELL' OVO, NAPLES, ITALY

Dating back to 1154, this ancient city fortification (of which only a portion is still standing) was designed to protect the harbor. This photo, taken during World War II, shows U. S. Army men in the foreground (Official U. S. Navy Photo)



FORTIFICATION



history finds numerous references to defensive fortifications such as the story of how Troy (*q.v.*) safely withstood the Grecians until the colossal wooden horse was taken within its walls. The walls of Babylonia were 32 ft. thick, 100 ft. high, and strengthened by great towers. The walls of Jericho resisted the invading hosts of Israelites, and, according to the Scriptures, crumbled before them only after divine aid was extended. Many ancient walls of Asiatic cities still remain. Though they well resisted the attacks with battering rams and ancient implements, they could hardly withstand a test against modern ordnance.

Soon after gunpowder became known to the Europeans, the modern nations began to devise new implements of war, and likewise sought to counteract their effect by powerful works of defense. The Italians began in the 15th century to construct bastions, while the French engineer, Sébastien de Vauban (1633-1707), who served under Louis XIV, developed the *bastion system*. A bastion comprises a pentagon-shaped (five-sided, five-angled) defense, with one side of the pentagon placed along the wall of the fortification, the angle farthest from the wall being known as the salient. The two sides adjoining the salient are known as faces, the two sides connecting the faces with the wall being called flanks. A line of these bastions, connected by protective curtains, is known as the bastion system. The Frenchman, Marquis René de Montalembert (1714-1800) recognized the fallacies of this system, by which a siege had become principally an artillery duel between attackers and defenders. France, however, rejected his ideas and it was in Germany that his theories found realization, becoming known as the *polygonal system*.

FORTIFICATIONS (from top to bottom)

CITADEL OF HENRI CHRISTOPHE, HAITI

This is typical of the kind of fortification found throughout Europe in the 17th and 18th centuries (Photo by B. Holmes, courtesy Ewing Galloway, N. Y.)

OLD FORTRESS, ZANZIBAR, EAST AFRICA

An example of English colonial fortification, this fortress was "modernized" on an old Arabian plan during the 19th century. Today it is of little protective value (Courtesy Canadian Pacific Steamships Ltd.)

FORT MOULTRIE, SOUTH CAROLINA

An interior view of an American Civil War fortification (Courtesy National Archives, Wash., D. C.)

PLAN OF FORT TOTTEN, NEW BERN, N. C., 1863

Even at the time of the American Civil War, forts still followed the pattern used 600 years earlier for the Castel del Monte (Courtesy National Archives, Wash., D. C.)

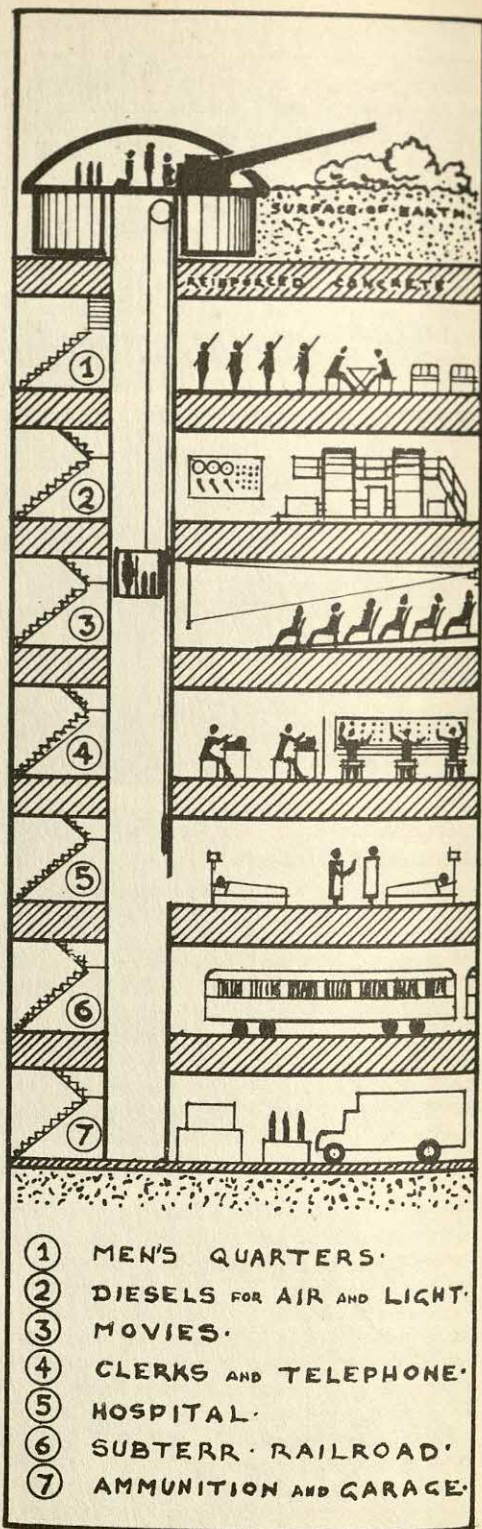
FORTIFICATION

Once termed "an immense battery," this system is essentially a simple one, bringing an overwhelming fire to bear against the besieging foe. Here, the bastions are omitted and the main faces are prolonged to the angles.

In constructing *field fortifications*, engineers take advantage of position with the view that the enemy will be exposed to fire and cross-fire in making the attack. The general plan aims to require a hazardous march across an open field, in which those within the line of fortifications may at an advantageous time send forth detachments to make countercharges. Among the field fortification works is the *redan*, which forms an angle in front of the enemy. It has two parapets protected by a ditch; the *redoubt* is an enclosure with a parapet and ditch encircling it; and the *lunette*, a redan construction with numerous short flanks. These works are so constructed that they flank each other within the range of rifle fire, and are further strengthened by entrenched camps and by a series of rectangular, or square, redoubts. In case the time to construct is limited, such simple entrenchments as shelter-trenches are speedily thrown up. These temporary forms consist of earth thrown toward the front, back of it being a ditch in which the rifleman lies securely protected from the fire of lighter implements. An *abatis* of felled trees and barbed-wire fences is effective in impeding the advance of the enemy.

Coast fortifications are quite different from those constructed for the defense of interior positions. Heavy ordnance which throws high-explosive shells great distances has revolutionized defensive warfare. Guns have been developed effectively to counteract enemy fire, even at great distances. For additional protection the enemy's ships are watched with the aid of powerful electric lights and swift steamers are utilized in scouting. Radar (*q.v.*) and aircraft have more recently replaced searchlights and scout vessels. In many instances electronic torpedoes plow under the water, aimed to strike enemy ships from below. The outer defensive works consist of submarine mines, which are set off by the enemy's ships or by means of electric connection from the shore. The coast defenses of Singapore offer a notable example of this type of fortification. It had been believed that they rendered the island invulnerable to attack, but during World War II, the coast defenses were nullified by a land attack when the Japanese advanced from the rear through the Malayan jungle.

Permanent fortifications are constructed of massive stone and iron works and are designed to defend important cities or strategic points. It is doubtful whether any fortress can be built that would form a serious obstacle to a modern land and naval attack, if the assailants were supplied



MAGINOT LINE, FRANCE

with the most powerful modern guns. The greatest fortress in the world is the celebrated stronghold of Gibraltar, on the coast of Spain.

Since modern guns have been able to obliterate practically all the older forms of fortresses, the newer are designed for offensive action rather than as great strongholds of defense. They are constructed on the spherical plan, supplied with guns of the heavier caliber, and designed for special effect against ricochet firing. Places permanently fortified are inclosed by *ramparts*; the upper surface, called the *terreplein*, serves as the location of troops and cannon. *Parapets* or *breast-works* protect the terreplein against the fire of the enemy, while *embrasures*, through which the guns are fired, pierce the parapets.

The *Maginot Line* constructed in France typifies the modern system of fortifications. Built between the two World Wars along the Franco-German frontier, the line comprises a vast, connected system of underground chambers, magazines, communication lines, etc., protected by concealed blockhouses. During World War II, however, the Maginot Line was of little avail, for the German armies bypassed it. Germany's *Siegfried Line*, or *West Wall*, was somewhat similar, but was based on different principles than the French fortification, e.g., it could provide a springboard for attack as well as effective defense. However, it was successfully breached by the Allies, 1944-45.

Fort Jackson (*jăk's'n*), fortification formerly guarding the entrance to New Orleans and the mouth of the Mississippi River, Louisiana. This fort was one of the leading defenses of the Confederacy until 1862, when it surrendered to forces under the command of Adm. David Farragut.

Fort Jay (*jă*), U.S. military post on Governor's Island, in New York Harbor. In 1800 the island was deeded to the U.S. by the New York state legislature, and in 1806 a permanent fortification was built on the site of Ft. Jay. Extensive improvements were begun in 1901 including the erection of new docks, warehouses, barracks, and officers' quarters. The area is 204 acres. Formerly known as Ft. Columbus (1806-1904), the fort was renamed in honor of John Jay (*q.v.*).

Fort Knox (*nôks*), a U.S. military post ca. 3 m. s.w. of Louisville, Ky. The 33,000-acre post, established as a permanent post in 1932, is the site of the Armor School. Since 1936, the U.S. Gold Bullion Depository, a heavily guarded, bombproof and burglarproof structure, has been located here. The underground vaults are of torchproof steel.

Fort Leavenworth (*lěv'en-wărth*), a U.S. military post on the Missouri River, 3 m. n. of Leavenworth, Kans. Established in 1827, the 8,000-acre installation is the site of the Command and General Staff Coll. and of a Federal prison. The Army War Coll., formerly located here, was re-

moved to Carlisle Barracks, Pa., in mid-1951.

Fort Lee (*lě*), a borough in Bergen County, New Jersey, on the west side of the Hudson River. Located on the Palisades, it forms a terminus of the George Washington Bridge (*q.v.*). Fort Lee, a residential suburb of New York City, was an early center of the motion-picture industry. Palisades Interstate Park, located along the river bank, continues northward from the town. A monument commemorates Ft. Lee's part in the American Revolution. The actual fort (originally Ft. Constitution) was built opposite Fort Washington (*q.v.*) to block the river. Held by Americans under Gen. Nathanael Greene, it was evacuated on Nov. 20, 1776, the troops narrowly escaping capture by British forces under Gen. Cornwallis. The borough, once part of Ridgefield township, was incorporated in 1904. Population, 1950, 11,648.

Fort Macon (*mă'kôn*), formerly one of the defenses of Beaufort Harbor, N.C. It was taken by Federal forces in 1862.

Fort Madison (*măd'i-s'n*), county seat of Lee County, Iowa, on the Mississippi River, 18 m. s.w. of Burlington. Among the chief buildings are the state penitentiary, the Catermole Memorial Library, and the high school. It was settled in 1833 and incorporated in 1838. Population, 1940, 14,063; in 1950, 14,954.

Fort McAllister (*măk-ăl'is-tēr*), Civil War fortification near Savannah, Ga., on the Great Ogeechee River. Its capture in December 1864 completed Sherman's "march to the sea" and opened the gates to Savannah.

Fort McDowell (*măk-dou'ěl*), former U.S. military post on Angel Island, in San Francisco Bay, Calif. It was declared surplus in 1946, and was assumed by the War Assets Administration in 1947.

Fort McHenry (*măk-hěn'rĭ*), former U.S. military post on Whetstone Point, Patapsco River, Md. It was first occupied for military purposes in 1775, and was later established as a permanent Federal fortification in 1794. It was named after James McHenry, one of Washington's secretaries during the Revolution and later Secretary of War.

In 1814 Ft. McHenry was attacked by the British fleet under Adm. Cockburn. During the night of Sept. 13, Francis Scott Key (*q.v.*), an American patriot detained aboard a British vessel during the bombardment of the fort, kept a constant vigil to see if the American flag was still flying above it. When the fort successfully withstood the attack, Key was inspired to write the song which later became the U.S. national anthem—"The Star-Spangled Banner." Fort McHenry is now a national monument and historic shrine. See also *National Anthem*; *Star-Spangled Banner*.

Fort McIntosh (*măk'in-tôsh*), U.S. military

FORT McPHERSON

post near Laredo, Tex., on the Mexican border.

Fort McPherson (*măk-făr'sən*), a U.S. military post in Fulton County, Georgia, 4 m. s.w. of Atlanta. It is headquarters of the 3rd Army Area and miscellaneous Army units are stationed here. The post was established in 1889 and was named in honor of James Birdseye McPherson, a general in the Union Army during the Civil War.

Fort Meigs (*mēgz*), former fortification at Maumee Rapids, Ohio. It was the scene of a battle in 1794 and again in 1813 when the British were defeated here by the Americans.

Fort Mifflin (*mif'līn*), former fortification on Mud Island, in the Delaware River, Pennsylvania. Controlling the approach by water to Philadelphia, it was the important factor in shutting the British off from communication and supplies when that city was captured by Sir William Howe in 1777.

Fort Mims (*mīms*), MASSACRE OF, an assault during the Creek War, Aug. 30, 1813, at Ft. Mims, on the Alabama River, ca. 35 m. N. of Mobile, Ala. The fort was a temporary stockade. About 550 persons had assembled there for protection, when Creek warriors, led by their chief, William Weatherford, a half-breed, attacked. The defenders of the fort fought vigorously but were overpowered and massacred; only 15 escaped.

Fort Monmouth (*mōn'm'th*), a U.S. military post in Monmouth County, New Jersey, s.e. of Red Bank. Made a permanent post in 1925, it is the seat of the Signal School of the U.S. Army.

Fort Monroe (*mūn-rō*), OF FORTRESS MONROE, situated on Old Point Comfort, a peninsula in Virginia dominating the entrance to Chesapeake Bay and Hampton Roads. The fort, erected (1819-34) by the U.S. government, was named for President James Monroe. Throughout the Civil War, the fort was an important Union stronghold. After the war ended, Jefferson Davis was imprisoned here for two years. The site of a U.S. Army coast artillery post and school for many years, Ft. Monroe was the headquarters of the U.S. Continental Army Command in 1958.

Fort Morgan (*mōr'gān*), county seat of Morgan County, Colorado, on the South Platte River, 70 m. E.N.E. of Denver. It is on the Chicago, Burlington & Quincy and the Union Pacific R.R.'s. The city is a trading center for grain and seeds, and tool factories and a sugar refinery are located here. Fort Morgan was settled around the site of a station and military post on the Overland Trail during the gold rush. It was incorporated in 1887. Population, 1950, 5,315.

Fort Moultrie (*mōl'trī*), a fortification situated on Sullivan's Island, near the entrance to Charleston Harbor, South Carolina. In 1776 the British fleet under Sir Peter Parker and a force of regulars under Sir Henry Clinton made a combined attack on the installation, then known



Courtesy Div. of State Publicity, N. Y.

FORT NIAGARA. MOAT AND ENTRANCE

as Ft. Sullivan. The fort was successfully defended by a 500-man garrison under command of Col. William Moultrie (in whose honor the fort was later renamed) and about 6,000 armed Americans in the vicinity. The British failure to take the fort compelled them to abandon their invasion of the South. However, a second attempt by the British to conquer Ft. Moultrie was successful, and it surrendered on May 6, 1780. In December 1860 Ft. Moultrie was evacuated by Maj. Robert Anderson, who used its garrison to strengthen Ft. Sumter (*q.v.*), and it was occupied by Confederate forces.

Fort Myers (*mī'ērz*), county seat of Lee County, Florida, on the Caloosahatchee River. Served by the Atlantic Coast Line R.R., the city is a shipping center for winter vegetables, flowers, and cattle. The Thomas A. Edison Winter Home and Laboratory (1884), open to the public, is located here. Ft. Myers, in the midst of a noted resort area, is near the shell beaches of Sanibel and Captiva Islands. The city grew up around a fort built here following a raid by the Seminole Indians in 1839 and was later named Ft. Myers in honor of Col. Abraham C. Myers. It was incorporated in 1905. Population, 1950, 13,195.

Fort Necessity (*nē-čēs'sī-tī*), a stockade erected by English troops under the command of George Washington, at Great Meadows, Pa., in 1754, in the course of an engagement with French forces. Fort Necessity Battlefield Site, so designated in 1931, is located here.

Fort Niagara (*nī-āg'a-rā*), a fort near the mouth of the Niagara River, overlooking Lake Ontario, in New York, erected by La Salle (*q.v.*) as a fortified trading post in 1679. This was later destroyed, and Ft. Niagara was built on the same site by the French in 1725. During the French and Indian War, in 1759, the English under Sir William Johnson captured it, thus cutting off the

French in Canada from their Louisiana territory. During the American Revolution, it was a center of British influence, from which expeditions were sent to points farther south. It was finally evacuated by the British in 1796, as provided in the Treaty of 1783, and became the seat of an American garrison. In 1813 it was captured by the British, who crossed over from Canada, but in 1815 the fort was again surrendered to the U.S.

Fort Payne (*pān*), county seat of De Kalb County, Alabama, known for coal and iron mining. Population, 1940, 4,424; in 1950, 6,226.

Fort Pickens (*pik'enz*), a fort on Santa Rosa Island, Florida, at the entrance to Pensacola Harbor. A Federal force under Adam J. Slemmer was in possession of the fort at the beginning of the Civil War and was besieged by Confederate troops under Braxton Bragg. In April 1861 reinforcements were sent to relieve the fort, and it was held by the Union throughout the war.

Fort Pillow (*pil'ō*), formerly a fort on the Mississippi River, Tennessee, 40 m. n. of Memphis. It was so named for Gen. Gideon J. Pillow, under whose direction it was built by Confederate forces in 1862. A small Union detachment captured the newly built fort and held it until April 12, 1864, when Gen. Nathan B. Forrest led an attack against them. Charges were later made that many of the Union soldiers, about half of whom were Negroes, were massacred after they had surrendered. In denying this, the Confederates maintained that the garrison conducted a reckless defense and that many of the soldiers were killed fighting after resistance was futile.

Fortress (*fō'trēs*), in military architecture, a permanent fortification, generally surrounding a town of strategic importance. In Central Europe, most medieval towns were considered fortresses, protected by walls and moats; isolated and protected portions of the fortification were called forts and were generally garrisoned with troops. See *Fortifications*.

Fort Riley (*rī'lē*), a U.S. military post on the Kansas River, in Riley and Geary counties, in eastern Kansas. Established in 1853, it was named for Maj. Gen. Bennett Riley, noted Virginian, during the Mexican War. For many years (1892-1946), Ft. Riley was the training center for U.S. cavalry units.

Fort Sam Houston (*hūs'tūn*), a U.S. military post in San Antonio, Bexar County, Texas. It is 4th Army Area headquarters; the Army Medical Service School was on the post in 1957, and miscellaneous Army units are also stationed there. The post was established in 1865, and its present site was occupied in 1879. It was named in honor of Gen. Samuel (Sam) Houston (q.v.).

Fort Scott (*skōt*), county seat of Bourbon County, Kansas, on the Marmaton River, ca.

90 m. s. of Kansas City. It is on the Missouri Pacific and the St. Louis-San Francisco R.R.'s. The city is located in a fertile farming and dairying region, and cement rock deposits are mined nearby. Manufactures include milk products, flour, and cement. Fort Scott grew up around an Army post established in 1842. It was incorporated as a city in 1886. Population, 1950, 10,335.

Fort Sheridan (*shē'rī-dan*), U.S. military post on Lake Michigan, near Chicago, Ill.

Fort Sill (*sil*), U.S. military post in Comanche County, near Lawton, Okla. In 1911 a field artillery school was established here, which was attended by officers of the regular Army and reserve forces; in 1957 the school was known as the Army Artillery and Missile School.

Fort Slocum (*slō'kūm*), U.S. military post near New Rochelle, N.Y., on Long Island Sound. In 1957 the Army Information School and the Army Chaplain School were located at Ft. Slocum.

Fort Smith (*smith*), county seat of Sebastian County, Arkansas, on the Arkansas and Poteau rivers, 130 m. n.w. of Little Rock. It is on the Kansas City Southern, the St. Louis & San Francisco, and other railroads. The city is a manufacturing and trading center for a coal- and gas-producing and general farming area. The manufactures include cottonseed oil, furniture, and brick and tile products. The city grew up around a military post, built in 1817 and used until 1871. Before the establishment of the state of Oklahoma, a Federal district court in Ft. Smith was responsible for maintaining order in Indian Territory: in 1875-96 it was presided over by Isaac C. Parker, under whom Wyatt Earp, Bat Masterson, and others served as U.S. deputy marshals. A National Cemetery (Civil War), historical buildings, and a reconstruction of the courtroom are maintained here. Incorporated as a town in 1842 and as a city in 1851, Ft. Smith flourished as a supply depot and departure point during the gold rush. Population, 1950, 47,942; in 1957 (special U.S. census), 59,959.

Fort Snelling (*snē'ling*), a former U.S. military post at the junction of the Minnesota and Mississippi rivers, near St. Paul and Minneapolis, Minn. It was established in 1820 as an outpost in the Indian country. See also *Saint Paul*.

Fort Stanwix (*stān'wīks*), a fort built by the English under Brigadier Stanwix in 1758, on the site occupied by Rome, N.Y. Early in the Revolutionary War, it was garrisoned by Americans and renamed Ft. Schuyler. In 1777 a British force under Barry St. Leger besieged the fort but was routed by a relief force of American troops under Benedict Arnold. Under the Treaty of Ft. Stanwix (1784), the Six Nations (q.v.) ceded to the U.S. all lands west of the Niagara River. See also *Rome, N.Y.*

